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AMERICAN POTASH INSTITUTE, INC.
INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Office: Investment Bldg., Washington, D. C.

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American Potash Institute, Inc.
Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*
G. J. CALLISTER, *Vice-President and Secretary*

"Son, when I was a boy, the fish in that stream . . ."

Better Crops with PLANT FOOD

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For men only, an essay—

On Being Domestic

Jeff McDermid

WHILE my wife prepares me a thumping big dinner let me suggest that every man ought to take a course in being useful around the home. Requirements in a liberal arts college should include a semester with the stewardess and a seminar in sewing. There is nothing which will give a man more fortitude than a work-out with the wringer or a wrestle with the range; and moreover, it should give him the practical background he sorely needs when the feminine members of the family brow beat and belittle him.

There are two kinds of husbands. One tribe boasts it can do a "brigand breakfast" over a woods fire and produce fish or fowl fit for a gourmet, even when the matches are wet and the water is dry. The other bunch of boobies don't know a dish-rag from a mop and use the same suds water for lingerie and overalls, and when they sew on a button it is done with dental floss and a darning needle.

Usually those proud outdoor home-ec exponents cease their labors when the fishing trip is over, and simply use their alleged prowess to entertain company, while the women scare up the sustenance. I am not so sure you can do much with these artful dodgers in anybody's finishing school of domesticity. They are posers and quitters. Some say they are just naturally he-men and need the tang of the primeval

forest or some ants in the gravy to get them in fettle for culinary endeavor. Personally I do not know which class to pity the least—the hubbies who could if they would or the others like myself, who would if they could. I presume that we should save all our commiseration, however, for their household victims in either case.

In early days pioneer husbands expected their wives to take over the greasy skillet where they dropped it and do the best they could with homespun makeshifts. That's mainly what they got married for in the first place. It was of course more reasonable and logical then, because there were not so many bridge parties and federated club wind-bag lecture courses to distract the domestic proclivities of the capable brides. There were not so many brush salesmen and vacuum cleaner demonstrators poking about on wash day, and a fellow could be pretty sure that the women were not on a sit-down strike listening to the serial story on the radio when the stew-pot should be simmering and the diapers drying.

OUR self-reliant foredads had no use for home demonstration agents, mechanical batter mixers, or powder puffs and stools in the kitchen. That's why all our grandmaws in those gilt-edged tintypes look so resigned and shiny-nosed. It's also explanatory why our prehistoric wedding pictures show the man seated comfortably while his wife stands up with a hand resting on his nigh shoulder blade. She's getting used to leaning on him to rest her legs (limbs) after doing 52 washings and ironings and 1,095 husky meals during her first year of married marathons—not counting a set of twins brought by a country doctor who called himself the "great deliverer," with no credit to the mother.

Modern men on the contrary need to know their way around the household far more than they are required to understand reciprocal trade agreements, the pros and cons of bigger navies, or what's wrong with the "groaned old party."

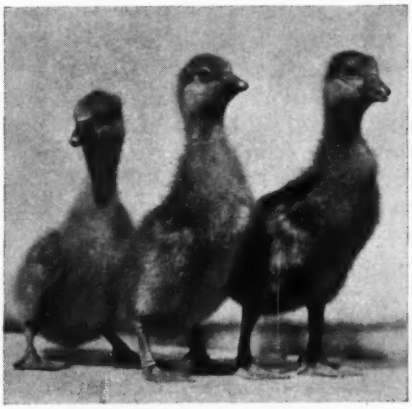
I know world-wise gents who let their wives press their pants because they can't unravel one of those trick ironing boards. I confess it is no easy task at that, being as finicky as teaching a calf to drink; and after attempting it a few times I signed up with the demon holding company for one of their electric contraptions to surprise my wife, of whom I am inordinately fond. All you have to do now is press a switch and it takes the tail right off your shirt.

WITH the women of this era launching boldly into all the sacred haunts of men and depriving heads of families of their lunch money, I see no hope for the masculine gender in a few more years. What boils me up is the crass indifference of the majority of our men to their impending doom. They still imagine themselves as acting the roles of their noble sires who went forth each morning with their bellies full of buckwheat cakes, armed with an axe and a shotgun, ready for trees or Injuns. Yet all our modern freeholders have to show that they are providers is a leather brief-case, and even the women tote hand-bags, so then what?

Sometimes I am slightly encouraged by the turn of the tide. I see that our own State university has four men students enrolled in domestic science out of about five thousand others marching to their downfall. I have a neighbor whose boy won a big prize in a cheese menu contest, but I shall warn him that cheese alone is constipating, and that he should broaden out. I know one farmer hereabouts who gave up showing cattle in disgust at the environment, and decided to adopt tastier tasks—so now he is showing off at our county fair with angel food cake and hooked rugs. He has nothing the matter whatever with his endo-

crine glands or his harmonic harmones, and I admire his skill even if the women claim he is an all-fired old nuisance. It just goes to show, that's all—some evidence of the rising renaissance to emancipate enslaved masculinity.

Women became emancipated some time ago, at least before *we* were wed.



These blabby photo mags of today show them in every conceivable, daring occupation in the realm of steeple chasing, shes on skis, and airplane stunting. Meanwhile you have to look long and fruitlessly to find a photo of our men folks excelling in the now neglected domestic arts.

TO be sure there are "Oscars" and other notable chefs whose soups and salads have tickled the salivary glands of generations, but I dare say any of those kitchen kings wouldn't fry an egg in their own homes. There'd be nobody on hand to tip or applaud them.

I have pondered on ways to encourage male domestic labor after the fashion of today's campaigns. I rejected the first hunch—to hold a culinary and home renovation contest—as being conducive to neighborhood jealousies with a depressing effect on the winners. My other idea was to nationalize a Men at Home Week with blurbs sponsored by salad dressing and kitchen kleener concerns. I copied that one from a farm paper, whose recent wash day for men campaign spurred the sale of motor sloshing machines beyond all expectations. But the trouble with all these artificial efforts is that women simply take advantage of the situation before the men really learn the ropes, and we end up in the same old stagnation.

BY the way, that farm paper I mentioned neglected its best opportunity to cut the crop surplus when they failed to get the women to exchange jobs with the men. It would have done more than Pope or McGill combined, and with Cotton Ed Smith thrown in, to ease the food flow and raise the prices. If persisted in for a summer the men would have prepared such miserable meals that the women couldn't have driven the cultivators or mowed the hay. And above all, it would have been perfectly constitutional!

If everybody's mother had the asthma or the neuritis, maybe more boys would become adepts at interior technic. My own early experiences in the labor of the home arose from maternal asthma, now called by the high-toned name, "allergy." Any kind of flour or baking powder dust bothered her, and hence my unwilling services were put to some use. I learned how to mix a lumpy mess of salt-rising bread and could do a Johnnie cake in a jiffy; yet the family all lived to quite an advanced age.

Old skills return occasionally when wife is absent or the girls rebel; but we have one convenience now that tempts me from my labors—the desk telephone. When I was a kid we either messed around the kitchen ourselves or starved.

But all this baking business stood by me well when I took up a claim in

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When, How, and Why Fertilize Your Lawn

By Howard B. Sprague

Agronomist, Agricultural Experiment Station, New Brunswick, New Jersey

THERE are literally millions of home owners in humid regions of this country who struggle unsuccessfully each year with the problem of producing a creditable lawn. They begin the season with high hopes, engendered by enthusiastic claims made by vendors of seed, fertilizers, and other materials, and by the natural urge that creeps into the veins of every individual when spring arrives. By midsummer the home gardener has all too frequently given up the struggle to crab grass, drought, disease, or other ills afflicting lawns. The regrettable part of this situation is that most of the disappointment, the waste of effort, and useless expense could be avoided by a better understanding of the requirements for growth of lawns.

This widespread failure on lawns may seem of small consequence to growers and dealers in agricultural supplies. To the individual home owner, however, the distress is just as great when the front lawn sickens and dies, as is the grief of the farmer when the crop on the east 40 fails. Moreover, in the aggregate, home owners represent an appreciable investment in supplies. For example, in the small State of New Jersey, there are approximately 500,000 home lawns of all sizes, in addition to a considerable acreage of grass in the public parks systems, on athletic fields, along highways, in cemeteries, and on the 150 golf courses of the State.

It is safe to say that the annual cost of materials used on turfed areas in the State is in excess of $5,000,000 annually, a large portion of which represents purchase of plant food in one form or another. The average home gardener has far less opportunity than the farmer to acquaint himself with the requirements for growing grass successfully, and consequently must lean very heavily on the advice of those furnishing his supplies.

Soil and Climate

Although the plant-food requirements of lawn grasses are relatively simple, they are in many respects unlike those of trees, shrubs, and flowers. The native vegetation of humid regions is composed largely of trees, and the soils and climate are suited to such plants. The natural grasslands of the prairie country are neutral to alkaline in reaction, deep and well aerated, rich in organic matter and available nutrients. By contrast, our humid eastern soils are rather strongly acid, relatively shallow and compact, and low in organic matter and nutrients. In addition, many home lawns are built not on true soil, but on excavated material deposited at the surface during construction.

One of the first essentials in feeding lawns is to provide adequate drainage, both at the surface and through the soil mass. Reasonably satisfactory aeration in the upper few inches of soil is necessary, and this can be assured by incorporation of a suitable type of or-

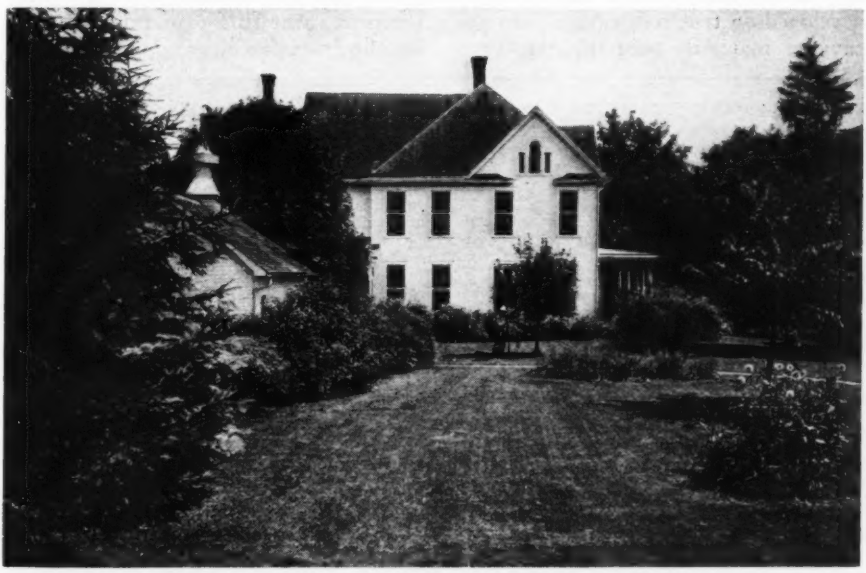
ganic matter. On lawns already established upon soils of inferior quality, semi-annual top-dressings with loamy soil will gradually correct this defect.

Nitrogen is unquestionably the most important element required by grasses. However, the mere application of nitrogen fertilizers may harm rather than aid the turf, unless the proper supplements are provided. The most essential of these supplements are lime, phosphates, and potash. Contrary to a firmly entrenched prejudice, all lawn grasses make more thrifty and durable growth on soils properly limed, than on strongly acid soils. Careful experiments have shown that even the bent grasses, long supposed to be acid loving, are unable to effectively utilize nitrogen in the form of ammonia compounds under acid conditions. Thus, in one carefully controlled test, the introduction of additional sulfate of ammonia to a well-balanced nutrient solution with strong acidity (pH 4.5) reduced growth nearly one-half; while the addition of an equal amount of nitrate of soda increased yields 20 per cent. When the acidity of the nutrient solution was corrected, sulfate of ammonia had no such harmful effect, and was fully satisfactory as a source of nitrogen.

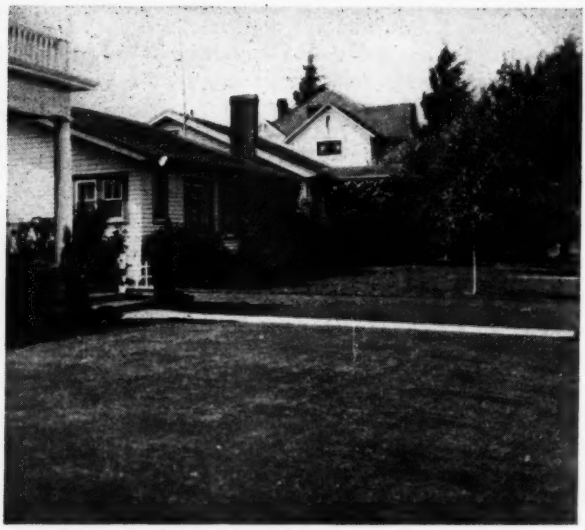
Correct Acidity

The significance of this principle lies in the fact that a great majority of lawn soils are strongly acid, and that a large percentage of commercial fertilizers supply nitrogen in the form of ammonia compounds. In using such fertilizers, it is necessary to correct any excessive acidity well in advance, by the application of lime. In general, 50 pounds of hydrated lime or 75 pounds of finely ground limestone per 1,000 square feet, will usually prove adequate for a 2-year period. Moderate to strongly acid soils (pH below 5.5) are less satisfactory for grasses than mildly acid to neutral soils, due to the tendency of the former to produce a sod-bound condition. Acid soils are likewise less permeable to water, and thus greatly exaggerate the effects of droughts.

Too little attention has been paid to proper balancing of nitrogen with



A good lawn provides an appropriate setting for shrubs and flowers.



This bent grass lawn responded to good treatment and produced a beautiful green sward.

phosphates and potash. Since nitrogen fertilizers give the most spectacular response, it has been assumed that these other elements were unnecessary. Soils well supplied with phosphates and potash, on which the use of such minerals will show little response, are exceedingly rare on home lawns and similar turfed areas. Even pasture sods, developed on true soils rather than excavated material, generally display a great lack of minerals. In 1936, a group of 26 pasture tests located on a wide range of soils, averaged little more than half as much growth from use of nitrogen fertilizers as from nitrogen supplemented with phosphate and potash. The use of complete fertilizers is important from the standpoint of the effect on type of growth produced. Nitrogen fertilizers alone tend to stimulate top growth at the expense of the density of the turf. Large amounts of clippings are produced without corresponding improvement in the quality of sod left below the cutting level. The following table illustrates this point.

The soil on which the above tests were conducted was relatively fertile; even more striking results may be expected on poorer soils.

Fortunately for all concerned, it has been shown rather clearly that plant nutrients supplied in *soluble* commercial fertilizers are entirely satisfactory for turf culture under most conditions. Reliance on such *slowly available materials* as bone meal, tankage, dried manure, etc., is one of the chief reasons for the astounding vigor shown by crab grass and summer weeds. Such organic fertilizers release plant nutrients during the hot moist periods of summer when crab grass thrives, rather than in the spring and fall months during which the permanent turf plants derive most benefit from fertilizer applications.

Treatment	Amount of clippings	Amount of tops below clipping level
No fertilizer	100%	100%
Nitrate of soda	151%	109%
Nitrate, phosphate, and potash	164%	137%

Lawns become green considerably earlier in spring and remain luxuriant for a longer period in fall with soluble commercial fertilizers than with organic materials. By applying soluble fertilizers in very early spring, and again in early autumn when summer weeds are disappearing, the desired turf grasses can be strengthened without danger of stimulating the summer pests. This type of fertilization, together with the adoption of a proper

(*Turn to page* 46)

Out of the Wealth Of Our Soils

By C. J. Chapman

Soils Department, Wisconsin College of Agriculture, Madison, Wisconsin

WISCONSIN has developed a great dairy and livestock industry. We have adapted our system of farming to a topographic and climatic heritage. It is perhaps the only type of farming that can survive. It has been said that Wisconsin is a State of great agricultural wealth. But the wealth of its agriculture is represented more in its fine barns, silos, and physical equipment than in the native or potential resources of its soils. In fact, we have built these fine barns, silos, and farm homes, have equipped these farms and have stocked them,—our fathers and grandfathers and their families have gained a living these past 50 to 90 years—all out of the native productiveness of soils which at the outset were not too well stocked with plant food.

And while it is true that our livestock system of farming has done much to preserve the fertility of our soils, yet there has been and still is a constant drain on the fertility of the soil. Not only is plant food being sold in the form of dairy products, livestock, and some cash crops, but even in a dairy system of farming we have been wasting fertility. Tremendous losses of plant food have been and are being incurred in the handling of the manure—losses amounting to better than $30,000,000 each year. These losses have been offset to some extent in the plant food gained through the purchase of mill feeds brought in from other States and through the purchase of some commercial fertilizers. But these gains are small compared to the total losses. In 1937 Wisconsin farmers purchased about 43,000 tons of commercial fertilizers, which at an average cost of $35 per ton would amount to only about $1,500,000.

Our farmers have been slow to

Colby silt loam soils of Wisconsin respond to potash. On the Vern Howard farm, Neillsville, Wis., 200 lbs. of an 0-20-20 fertilizer more than doubled the yield of oats. The residual benefit to alfalfa the following year resulted in a ton increase in the yield of hay.

recognize the need for repairing their soils. The average farmer spends several hundred dollars every year in the repair of his buildings, machinery, fences, and the purchase of new equipment. We seem to accept these general maintenance and repair charges as part of our necessary overhead, and it is true we must keep our physical plant in a reasonable state of repair.

But what about our soils? Should they not come in for their share of general maintenance costs? I am suggesting to my farmer audiences that at least $100 be spent every year for lime and fertilizers. Really this expenditure for fertilizers and lime may be looked upon as more or less of a capital investment as well as an annual repair charge. I point out to farmers that if they would spend as little as $100 each year for a period of 10 years, that at the end of that time they would have built up the productiveness of their soils by at least 25 per cent, and on some farms I am confident that they would see a doubling of the present feed production and livestock carrying capacity of their farms.

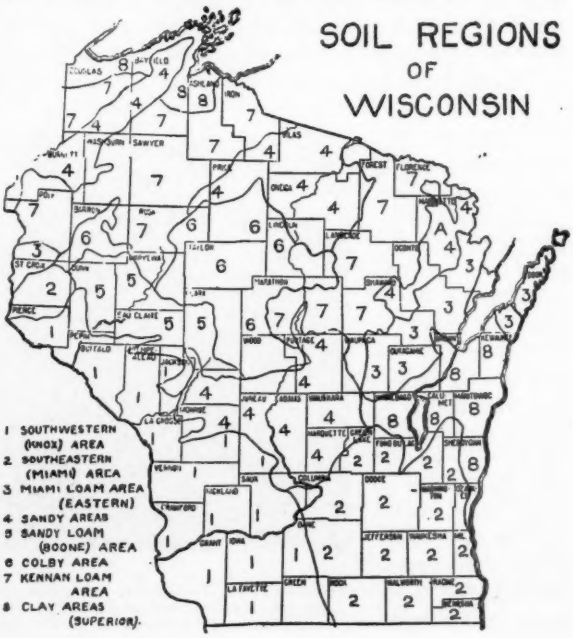
If every farmer in the State was to follow my recommendations and purchase, let's say, just 2 tons of fertilizer each year, we would create a market for nearly 400,000 tons of commercial fertilizer a year. And that is about the amount of plant food Wisconsin farmers should be using to break even with losses that are being incurred at the present time.

But how to sell this idea, how to get farmers to see the economy of investing some money in plant food? Well, that is the challenging task we extension specialists, county agents, Smith-Hughes teachers of agriculture, Federal A.A.A. and S.C.S. representatives, as well as hundreds of others engaged in the commercial end of actually selling these fertilizers, must work toward.

Dairying Endangered

I am convinced that unless something is done to awaken our Wisconsin farmers to the seriousness of their soil fertility problems and get them to do something about it, that our great dairy industry will eventually fail. I predict that the future prosperity of Wisconsin dairy farmers will be measured by the extent to which they follow out a soil improvement program.

As I look at the map of Wisconsin outlining the soil regions and visualize the rough, rolling topography of district No. 1, as I see the soils of this region becoming thinner and thinner with the work of erosion taking its toll, as I see the rills and the gullies cutting into the hillsides, as I see the lean, lank herds of dairy cattle in an over-stocked, over-grazed, over-crop-



ped system of farming, as I see the vast areas of sandy soils in central and parts of northern Wisconsin, located on this map in districts 4 and 5, as I see the abandoned farms, the sand blows, and struggling farmers eking out a bare existence on these depleted soils, as I visualize the stony, stumpy, humpy areas in district 7 with scattered settlements of hard-working, horny-handed farmers, and their forlorn wives and under-privileged children, and again as I view the desperate feed problems and declining fertility of that vast area of Colby soils in district No. 6, I can see a gigantic and never-ending job ahead in the accomplishment of a soil improvement program for these areas.

Even as I turn to districts No. 2 and No. 3 and visualize the opportunity for soil improvement in these more prosperous areas of diversified dairy and special crop farming, I can see unlimited opportunity for service in the field of soil improvement.

Need for Potash

There seems to be an ever-increasing need for potash on soils that years ago were supposed to be adequately supplied with total potassium. We have, of course, recognized for years the need for potash on our low bottom mucks, peats, dark-colored sandy and clay loams. Most of the sandy soils of Wisconsin are known to be deficient in potash, but we have been amazed to note the marked response to potash on some of our silt and clay loams.

In the north-central part of Wisconsin we have an area of silt loam that originally supported a heavy growth of hard wood timber. The soils of this area have been mapped as Colby silt loam and total something over 5,000 square miles. This area has developed into a very intensive dairy region. There are a good 30,000 farmers living in the area. Most of these farms have been developed within the last 40 years. The farmers have hewed their farms out of this "cut over" wilderness, and indeed we see today evidence of the great thrift and enterprising spirit of these late pioneers in their fine barns, silos, and farm homes. But something is happening to the farms of this area that is causing real concern to the farm leaders of Wisconsin. There has developed in the past few years a very serious feed problem. In fact, a most acute feed situation has arisen in this area. Drought has been a factor some years, but drought is only a part of the story. Clover failures and declining yields of corn and small grain are very much in evidence. The farm mortgage load is increasing.

Results with fertilizers on the Marshfield Branch Experiment Station have been pointing for years to the need for lime, phosphates, and potash. But even the results of the Marshfield Station have not been sufficient to arouse farmers in the area to the seriousness of their fertility problems.

Cooperative demonstrations with farmers in this Colby area have convinced us that the lack of fertility is the chief reason for this alarming feed shortage that has become so acute in recent years. The surprising and almost amazing results of these demonstrations show in every case a marked response to potash. In fact, it would appear that the lack of available potash in these Colby soils is more responsible for clover and alfalfa failures and the poor yields of grain and corn than is the lack of lime and phosphate, although all three seem to be needed. We have observed that the use of phosphates alone may even accentuate the need for potash.

In a demonstration set up in 1936 on the Vern Howard farm located near Neillsville, a comparison was made of straight 20 per cent superphosphate and 0-20-20. The field was limed at the rate of 3 tons per acre and seeded to a mixture of alfalfa and timothy with oats as a nurse crop. The year 1936 was unfavorable for small

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Safeguard Fertility of Your Orchard Soils

By F. W. HofMann
Agricultural Experiment Station, Blacksburg, Virginia

ANOTHER year rolls by making 25 years or a quarter century of experimentation with problems of orchard fertility at the Virginia Agricultural Experiment Station. Valuable results have been secured from these experiments, profiting immensely not only the fruit growers of Virginia but those elsewhere. The results secured from these experiments have provided practical information to fruit growers enabling them to proceed in the management of their orchard soils with greater assurances and efficiency.

These results show clearly and definitely that efficient management of an orchard soil cannot be conducted without a program of thoughtful soil fertilization. In such management the three essential plant-food elements, namely, nitrogen, phosphorus, and potassium must be provided in some form at some time in the average orchard soil. Earlier in the younger stage of tree growth for perhaps 10 to 15 years, the noticeable responses in apple trees will show up from nitrogenous application. From then on, however, some provision must be made for phosphatic and potassic supplies, not because these materials are not usually present in large abundance in many orchard soils, but because they are beyond the possibility of exploitation by the foraging activities of the roots, particularly of many apple tree varieties.

Five different apple orchards near those of the Virginia Agricultural Experiment Station plats at Blacksburg, Va., as well as numerous large, well-managed commercial orchards, both apple and peach have shown profitable gains due to proper attention to the needs for complete fertilizers. These apple orchards are mostly over 20 years of age, and each year as they grow older show the value of a complete fertilizer program. Instance after instance illustrating the full needs of older bearing apple trees is now coming to light, not only in Virginia and its adjoining fruit-producing sections, but from elsewhere. Even after only one season's treatment, apple orchards have yielded very profitable gains.

Interesting Results

The results of this past season of 1936-37 bring out some very interesting information in a fertilizer experiment on a neglected, 23-year-old York Imperial orchard near Blacksburg. This neglected orchard was selected because of the extreme malnutritional condition of these trees. In the fall of 1936 two sets of the trees received a nitrogenous application with no phosphorus or potash. Two other sets for respective parallel comparison received phosphorus and potash in addition to nitrogen. The complete fertilizer used was of a 10-6-4 proportion. The analaysis indicated by the tag is as follows: *Mineral Nitrogen* 97 per cent of the total derived from Sulphate of Ammonia—Nitrate of Soda. Organic

Nitrogen 3 per cent of the total derived from Cyanamid-Urea = *Avail. Phosphoric Acid* derived from Superphosphate = Potash derived from Muriate of Potash. The yields of one compared set after one season (1936-1937) are shown in Table I. A gain of about 2 bushels of fruit shows up in favor of the complete fertilizer series. These results are presented to show that as apple trees grow older they will be more likely to show the more outstanding responses to complete fertilizers. The greater benefits that can be secured from complete fertilizers will be brought out later in this article.

TABLE I

Row No.	Treatment	Yield in Bushels
1	Complete fertilizer	10
2	Nitrogen only....	8.23
3	Complete fertilizer	8.64
4	Nitrogen only....	6.64

It is also of interest to study results that have been secured with peach trees. Recently F. F. Cowart and H. L. Cochran have reported the results of their work at the Georgia Experiment Station in cooperation with the U. S. Department of Agriculture. The orchard from which the data were secured is of the Elberta variety and was set out during January 1929. The soil is typical of the Cecil sandy clay loam of the Piedmont section. The different fertilizer plats have received like treatments as to sprays, cultivation, and pruning. The fruit was purposely not thinned at any time.

Plat treatments included no nitrogen, 4 per cent, 8 per cent, and 12 per cent nitrogen. The phosphoric acid and potash content of the fertilizer was kept constant at 8 and 6 per cent, respectively. Nitrate of soda, sulphate of ammonia, and cotton-seed meal were used as sources of nitrogen, while the phosphoric acid came from 16 per cent superphosphate, and potash from muriate of potash. The basal rate of fertilizer application, 6 pounds of mixed fertilizer (N-P-K) per tree, was applied the first of March. It is well to call the reader's attention, particularly at this time of the year in anticipation of peach fertilizer needs, to the fact that Georgia investigators made their fertilizer treatments of

For heavy, lush growth of an orchard ground cover which later becomes valuable moisture-conserving organic matter, a complete fertilizer gives the most outstanding results.

such a nature as to throw some light also on the time and quantity of nitrogen application.

They explain that phosphoric acid and potash are less easily leached from the soil, and the time of their application need not give the peach grower as much concern as applications of nitrate of soda. Certain of these experimental plats received an additional application of nitrate of soda on June 1. Other plats receiving no nitrogen ripened the earliest, and ripening was progressively retarded as higher percentages of nitrogen were included in the fertilizer. The trees receiving a 4-8-6 fertilizer were of medium vigor, in good bearing condition, and ripened their fruits rapidly. Trees which received 8 and 12 per cent nitrogen were somewhat more vigorous, as evidenced by the larger number of peaches they produced, greater terminal growth, and the later date at which the heaviest picking occurred.

In these fertilizer investigations with peaches Cowart and Cochran call attention to the fact that though trees receiving phosphorus and potash with no nitrogen have yielded no more than trees left unfertilized, these results do not preclude the possibility that phosphorus or potash or both applied in combination with nitrogen may be beneficial over a period of years or may increase the carrying quality of the harvested fruits. With increased nitrogen applications, tree growth and fruit production were increased. The increased production on trees receiving the higher application for the 1936 season is due to the increased set of fruit and not to any increase in size of individual fruits. The 1936 growing season, which was particularly dry, was more adverse to fruit enlargement on trees receiving a large amount of nitrogen because of their greater leaf surface and a consequent greater demand for water.

During the previous growing seasons when the rainfall was more nearly normal and the water supply to the trees more nearly adequate, the fruits on trees receiving 4 and 8 per cent

The low state of vigor in the apple trees of this neglected 22-year-old York Imperial orchard is particularly noticeable in the foreground. All trees were subjected to conventional pruning and thorough spraying. Those trees in the plat receiving a complete 10-6-4 fertilizer combination produced, the season following application, 10 bu. per tree in one series and 8.64 bu. in another as compared to 8.23 bu. and 6.64 bu. for the nitrogen-only series. See table 1.

nitrogen attained larger size than the fruits of trees receiving other treatments. The development of color was adequate and essentially alike on all plats except those receiving 8 and 12 per cent nitrogen. On these plats the fruits did not develop as high color as on the other plats.

These peach fertilizer investigations from Georgia show that during 1936 and in previous years the most profitable fertilizer application among the treatments made in these experiments has been the use of a 4-8-6 fertilizer in the spring, supplemented by an additional pound of sodium nitrate applied June 1.

Need Complete Fertilizer

Superior results secured from complete fertilizers, as compared to nitrogenous application without phosphorus and potash, were reported some time ago by other investigators in peach sections similar to those in Georgia and Virginia on Cecil soil series. According to Rawl's observation in South Carolina, his demonstration with peach-tree fertilization, even though conducted for only 1 year, very clearly indicates that nitrogen alone is an improper fertilization practice in some of the peach orchards of South Carolina, and that significant responses were obtained from the addition of phosphatic and potassic fertilizers. The compared responses of fruit development are pointed out as probably the most striking phase of these peach fertilizer demonstrations.

According to Rawl the impressions of hundreds of peach growers, upon going over these demonstrations at and just before harvesting of the fruit, were that those plots receiving the three essential fertilizer elements produced practically 100 per cent fruit of desirable, marketable sizes, as contrasted with almost 100 per cent fruit of undesirable, market sizes in the sections with nitrogen without phosphorus and potash.

Close-up of a typical tree in the orchard photographed on the opposite page.

Of particular interest in Rawl's report are the chemical analyses made by Professor J. H. Mitchell of the South Carolina Agricultural Experiment Station. These analyses show that fruit harvested from the completely fertilized trees contained 21.7 per cent more total sugars and 31.7 per cent more sucrose than did the fruit from nitrogenous, non-phosphorus, non-potash treated trees.

Orchardists are beginning to realize more than they ever have before that much greater importance should be attached to the direct, superior benefits of complete fertilizers to fruit trees. This does not mean, however, that they should not also continue with greater zeal than ever in their efforts to improve the orchard soil, even though the benefits may not be derived by the fruit trees directly at that time. This applies especially to provisions for improving the humus content of the orchard soil. Just as Baker of Indiana recently comments in a report of his investigations to find out the relation of soil fertilization and soil moisture to growth and fruitfulness of apple trees under different systems of management, "Any satisfactory system of orchard soil man-

agement that will effectively promote and maintain optimum growth and production of apple trees must provide for the maintenance of an abundant supply of organic matter in the soil and for sufficient moisture for the use of the trees as their needs demand."

This statement aptly indicates the basic principles of vital concern to orchardists, especially when it comes to the management of a soil that is to provide amply for the moisture needs of fruit trees. After all what could an orchardist hope to do without an adequate supply of soil moisture? This question may appear entirely too naive, but then is it to be so easily dismissed?

Soil Moisture Vital

Let us briefly point out some of the vital needs of soil moisture in fruit growing. 1. Soil nutrients cannot be taken up unless they are in solution. 2. The normal physiological processes for fruit development would be impeded and even stopped without soil moisture. 3. Irregularity in soil moisture supplies with interrupted intake are altogether responsible for interrupted growth in the tree; checked fruit bud formation; poor fruit set; impaired size, color, finish, and quality of fruit; and development of water core, cork spot, and cracking of fruit.

One of the most frequent troubles incident to irregularity of soil moisture supplies at certain seasons of the year is the cracking of the fruit. This is most liable to occur shortly before maturity, when rains follow a period of drought during which the fruit has checked its growth. It is indicated by some authorities that apparently the checking of growth is accompanied by changes in the fruit skin, rendering it less elastic, so that when growth processes are accelerated, following a rapid moisture intake after a heavy rain, it is not able to expand at a rate rapid enough to make provision for the greatly increased turgidity of the tissue within. This has been found true in instances of the application of heavy, late irrigation following a protracted dry season. Peaches, plums, and most of the fruits of the stone class are especially subject to this cracking or fruit splitting. Frequently very serious damage occurs to Stayman apples because of such injuries.

This past season of 1936-37 near Blacksburg, Va., was an excellent one to study much in the way of the prevention of this fruit cracking. The season was characterized by its regular and even rainfall. With the exception of a week in May it rained on the average almost every other day throughout the entire growing season. There was a complete absence of fruit cracking in Stayman apples in this entire section. The very few exceptions were due to scab, cedar rust and other fungus pests, and on some weak, dying trees. Even in seasons of less regular rainfall, very little fruit cracking appears in the experimental plats which are liberally supplied with soil humus at this Station. Furthermore, the fruits in these plats are of more acceptable market size, of a more brilliant color with a higher, more attractive finish, more delectable in richer flavor, and decidedly finer in quality.

Soil moisture is of great value in putting fruit trees in a much more vigorous state to survive any adverse conditions both through summer and winter. Verner brings this out very significantly in a report of some of his observations made around West Virginia while connected with that Station.

In these reports of his observations he gives out the following particulars: "It is known that the depth and character of the root systems of fruit trees and the proportion of roots to tops are influenced by the normal water supply in such a way that a much reduced supply one season, while perhaps of sufficient quantity for trees long adapted to a low supply, may not be

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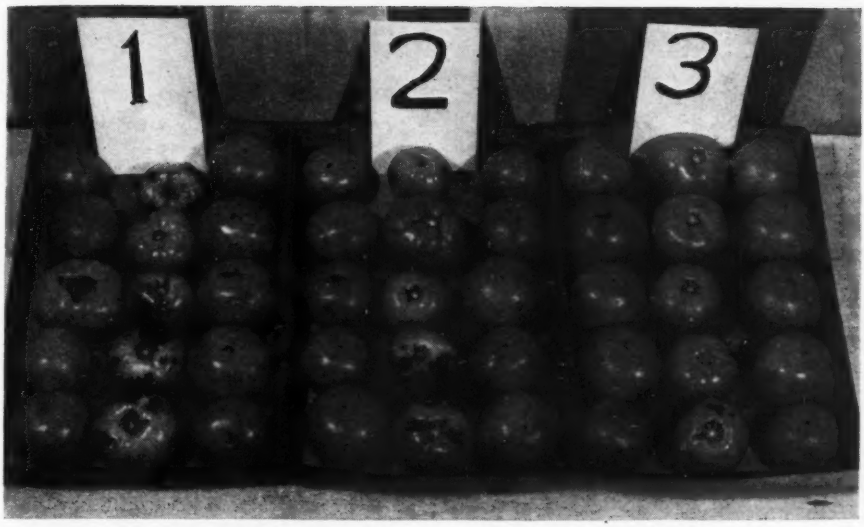

1. Tray from standard fertilizer plot. 2. Tray from check plot. 3. Tray from extra potash plot.

Soil Tests Improve Canning Crops

By William T. Ewen
Ontario Agricultural College, Guelph, Ontario, Canada

BELIEVING that soil tests point the way to a more intelligent fertilizer programme for canning crops, a cooperative experiment was carried out this past summer with canning tomatoes on the Canadian Canners Company farm near Aylmer, Ontario.

In May representative soil samples were taken from an 8-acre field on this farm and were analyzed by rapid chemical tests. Table I gives the results obtained. Since the soil throughout was low in available potash, the field was divided into three plots, (1) standard fertilizer, (2) check, and (3) standard fertilizer plus potash. The standard fertilizer was one commonly used in the Aylmer district for canning tomatoes.

Two weeks before planting, plots 1 and 3 received 100 lbs. of ammophos plus 37 lbs. of muriate of potash per acre, drilled into the soil. Each plot was planted with John Baer, Jewel's Chalk, and Bonny Best varieties. After planting, plot 3 received in addition 325 lbs. of muriate of potash per acre, cultivated in around the plants.

By mid-July there was a distinct difference in the growth and general appearance of the various plots. The plants on the plot which received

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A Primer Explaining Cotton Disease Control

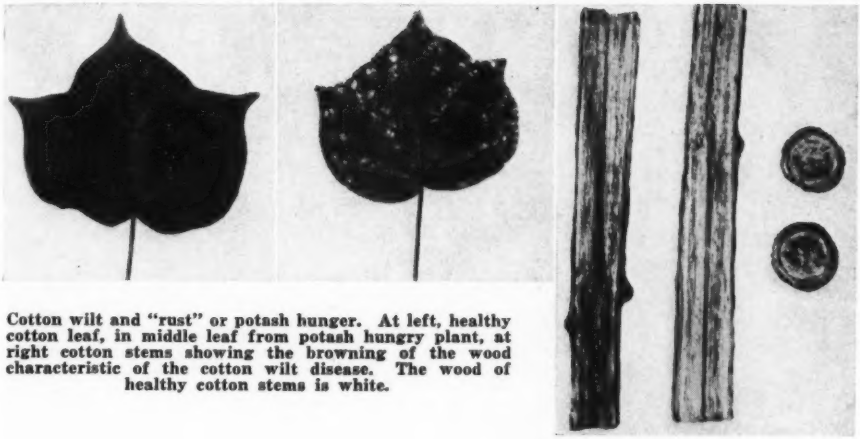
By V. H. Young
Agricultural Experiment Station, Fayetteville, Arkansas

ALTHOUGH many plant diseases may be controlled by means of fungicidal dusts or sprays applied during the growing season, little can be done about cotton diseases after the seed is in the ground. Since the losses from cotton diseases in the United States often amount to from 10 to 15 per cent of the crop and occasionally are much greater, it goes without saying that the preliminary planning and forethought necessary for the control of cotton diseases are well worth the necessary trouble.

The more important cotton diseases of the United States are the Fusarium wilt, the Verticillium wilt, Phymatotrichum root rot, "rust" or potash hunger, root-knot or nematode disease, various seedling blights, damping off, which is commonly designated as "soreshin," angular leaf spot, and various boll rots often erroneously lumped under the term "anthracnose." Much boll rotting is actually a phase of the angular leaf-spot disease mentioned above, or is the result of the action of various other parasites which have obtained entrance into cotton bolls following infection with the angular leaf-spot bacterium or through insect or other mechanical injury.

A severe case of damping-off or "soreshin" of cotton. Early planting in cool, wet soils favors this disease. Seed treatments, later planting, and a good seed bed reduce damage from soreshin.

Of all the diseases mentioned above, Phymatotrichum root rot (known also as "Ozonium root rot" and "Texas root rot") and the Verticillium wilt of cotton are the only ones for which no really adequate control measures are now available. Damage from Texas root rot is almost entirely confined to the State of Texas and other more westerly States, and its control constitutes one of the major unsolved problems left to the cotton pathologist. Certain ameliorative measures, such as the use of heavy applications of green manure, are now becoming available, but since they are still in need of further development and standardization they will not be considered further here. No adequate control of any sort is yet available for the control of Verticillium wilt, but its distribution is fortunately of limited extent.



Cotton wilt and "rust" or potash hunger. At left, healthy cotton leaf, in middle leaf from potash hungry plant, at right cotton stems showing the browning of the wood characteristic of the cotton wilt disease. The wood of healthy cotton stems is white.

Most diseases of cotton, and especially those which are directly concerned with conditions in the soil or which obtain entrance from the soil, are of gradual development. Once they are well-established in a particular piece of land, it may be asserted with reasonable certainty that they will continue to become increasingly more destructive there, if proper measures for their control are not taken. It, therefore, behooves the cotton grower to know what cotton troubles are most serious on his land.

Disease and Soil Type

If that land is heavy, clay upland or rich, heavy delta soil, the Fusarium wilt of cotton and the root knot disease are apt to be of slight importance, but Verticillium wilt in partciular may be looked for in the heavier Mississippi delta soils. If the land concerned is of a sandy alluvial type, Fusarium wilt, "rust" or potash hunger, and root knot or nematode disease are a trio which is apt to cause serious losses. Seedling blights of one kind or another, soreshin, and boll rots of various types are widespread, and their severity may vary greatly from year to year and with varying conditions.

Space does not permit a description of the important cotton diseases, but it should be emphasized that accurate information regarding the presence of cotton diseases in years past is the first prerequisite for the construction of any adequate, cotton disease-control program. With this information at hand, one needs to lay plans sufficiently early to allow the proper selection of cotton varieties, to allow for treating of seed, proper fertilizer applications for an adequate control program, and if necessary to plan for disease elimination through rotations. Cotton diseases, it should again be emphasized, cannot be controlled to any extent after planting time.

The seedling blights and damping-off diseases of cotton are especially important in cool, damp seasons, and when cotton is planted too early. It should be remembered that cotton is a semi-tropical plant which is decidedly unfitted to thrive in cool weather. Consequently, when weather is cool and damp, the seed germinates slowly, the seedlings emerge from the soil with difficulty, and may be in such poor growing conditions that they fall an easy victim to attacks of various soil fungi and in some cases to fungi borne in or on the seed.

The control of seedling diseases is largely a matter of making conditions right for prompt and vigorous growth

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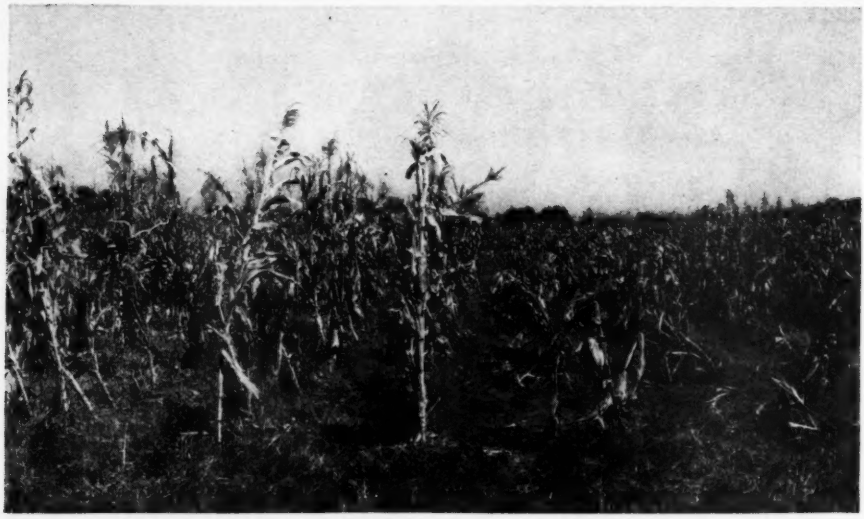

The corn on the left was fertilized with 100 lbs. of muriate of potash and 200 lbs. of nitrate of soda per acre, while that on the right received 200 lbs. of superphosphate and 200 lbs. of nitrate of soda per acre. Farm of J. B. Clayton, Falkville, Alabama.

Corn Can Be Grown On "Frenchy" Soil

By J. T. Hall

Teacher of Vocational Agriculture, Falkville, Alabama

IN THE north Alabama counties of Franklin, Lawrence, Morgan, Madison, and Jackson are located a number of areas of soil with a black surface and a bluish subsoil which are officially classified by the Soil Survey as Hollywood. It is a heavy clay, unsuited to cotton production, but makes good yields of corn when properly fertilized.

To farmers who cultivate these areas, however, the name given this particular soil type means little, but the descriptive term, "frenchy land," is readily recognized and needs no further explanation to them. Designation in this manner started years ago when knowledge of the value of fertilizer was limited. It was noted that without its use many attempts to grow corn met with failure because a large portion of the plants turned whitish, or the leaves developed alternate green and white stripes, and the stalks frequently fell to the ground before maturity.

This is commonly known, of course, as "frenching" and led to the application of the term to all areas where corn plants were affected in this manner.

While there has been little official experimental work in these areas, for years farmers have been following a plan of fertilization which has become

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Truck-crop Farming In Mississippi

By F. J. Hurst

Editor, Agricultural Extension Service, State College, Mississippi

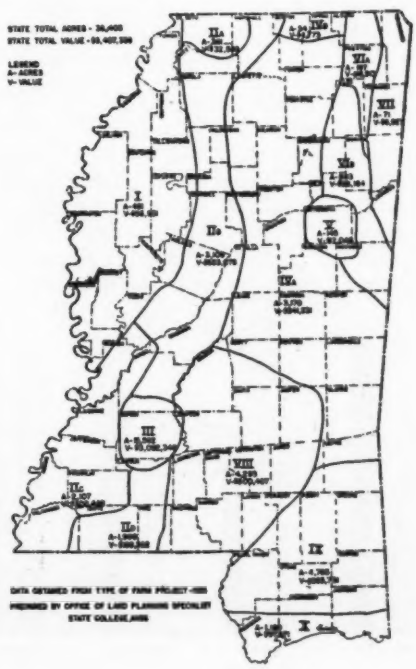
TRUCK-CROP farming is important in Mississippi because of the acreage cultivated, the income received, the employment given labor other than people who live on the farm, the market afforded for products of local industries, especially fertilizer and box factories, and the volume of freight furnished the railroads.

Type of farming areas in the State have recently been mapped by the Mississippi experiment station, the Bureau of Agricultural Economics, and the Agricultural Adjustment Administration under direction of C. O. Henderson, land planning specialist of Mississippi State College. This map shows that commercial vegetable production is centered in the Copiah County truck area. But during recent years truck-crop farming has been developed on a considerable scale in other type of farming areas, either as specialized truck farms or as a major enterprise on diversified farms.

Smith, Covington, and Yalobusha counties have become noted for production of watermelons. About 20 counties are growing Irish potatoes on a commercial scale. Tomato acreage has been increased in Hinds and Jefferson counties. Vegetable production has become a major farm enterprise in Marion County since establishment recently of a canning plant at Columbia.

In 1937 Mississippi producers planted 6,000 acres in snapbeans; 6,400 acres in cabbage; 3,000 acres in green peas; 9,500 acres in tomatoes; 8,700 acres in watermelons; 6,500 acres in Irish potatoes; 400 acres in strawberries, a total of 40,900 acres for market, besides 9,770 acres of snapbeans, beets, cucumbers, and tomatoes for canning.

The Bureau of Agricultural Economics estimated that the cash income from truck crops grown in the State for market and for canning, excluding Irish potatoes and strawberries, was $3,144,000 for the 1937 season compared with $2,705,000 in 1936. Pota-



toes and strawberries brought $322,000.

While production of most of the major truck crops was less than in 1936, better prices for cabbage and tomatoes pushed the 1937 income 16 per cent above that of 1936. A record crop of potatoes brought a very low price per bushel, and the cash income from this source was considerably less than for the smaller 1936 crop.

The accompanying diagram which shows the amount of plant food removed by different crops presents an interesting study. It will be noted that with the exception of beans, larger quantities of potash are removed by the different crops than either nitrogen or phosphorus. The removal of large quantities of potash by crops and erosion, coupled with the fact that until recent years mixed fertilizers usually carried a lower percentage of potash than of the other plant-food elements, may account for what is commonly described as "potash hunger" on some soils and the marked response of many crops on such soils to liberal applications of potash fertilizer, or a complete fertilizer high in potash.

Unfortunately many truck farmers in the principal trucking area of Mississippi have neglected terracing their farms, too little of the land has been planted to soil-conserving crops, and erosion has taken a heavy toll of soil fertility. As a result, increasing amounts of commercial fertilizers have been used and average yields have not been as high nor the quality of crops as good as where soil-building programs have been followed and the humus content of the soil maintained.

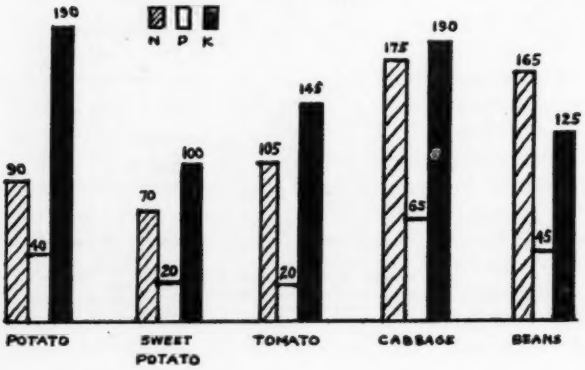
Copiah County growers alone purchased 13,354 tons of mixed fertilizers and other fertilizer materials, such as nitrate of soda and muriate of potash, in 1937 according to notifications filed by fertilizer manufacturers with the State Department of Agriculture.

Fertilizer Practices

A study of fertilizer practices followed by Copiah County growers last year showed that they used from 1,200 to 1,800 pounds of 3-8-5 or 4-8-4 under tomatoes and side-dressed with a mixture of nitrate of soda and potash. For cabbage, 1,500 to 2,000 pounds of 4-8-4 were used per acre, being applied before planting, and the plants side-dressed with 200 pounds of nitrate of soda. From 1,500 to 1,800 pounds of 4-8-4 per acre were most commonly used under beans and peas.

In field fertilizer tests conducted in 1937 by Lotterhos and Huber, large operators in Copiah County, 1,500 pounds of 4-8-8 fertilizer per acre produced larger yields of better tomatoes and returned a greater profit than 1,500 pounds of 4-8-4.

Following a three-day conference of fertilizer manufacturers, farmers, and agriculturists in Jackson last fall, the grades of fertilizers registered and sold in Mississippi were limited to conform as nearly as possible to the mixtures recommended by experiment stations. The grades adopted are as follows: 4-8-8, 6-8-8, 3-8-5, 4-8-4, 6-8-4, 6-12-6, 0-12-6, and 10-0-10.



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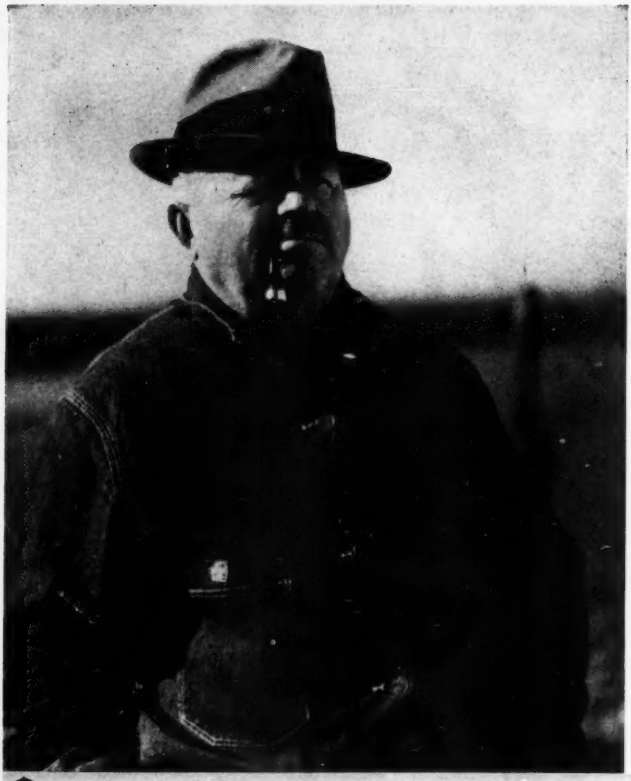
PICTORIAL

A REAL COWBOY MUST "STICK."

Above: Modern buildings do much to lighten chores.
Below: He's a balky, temperamental fellow.

Above: Farming involves a lot of pro and con.
Below: Anxiety reigns in this "breadline."



Left: Preparation for spring work requires much contemplation and planning.

Below: Kansas farmers on a "wolf drive." When one round-up is finished, hunters are transported to the next location by truck.

The Editors Talk

Don't Wait for SOS (Signs of Starvation)

In the emphasis being given to easily recognized signs of starvation for certain plant-food elements as shown by crops growing on soils deficient in these elements, it must be remembered that serious decreases in yields and quality will occur before these symptoms appear. In other words, signs of starvation represent extreme deficiencies. Profitable response to fertilizers can be obtained long before the plants tell what they need.

Growers should not wait for the SOS. Farming soils to the point of depletion of plant food is an old concept dating back to the days of new frontiers and almost unlimited virgin land which could be put into production when the other wore out. The newer concept is maintenance of building up the riches of our soils to meet the necessities of efficient and low-cost production and the scarcity of virgin soils within our boundaries.

Evidence of the need for wider recognition of the newer concept is seen in the observations of a writer published in the March issue of Country Home Magazine. This article is particularly interesting since it deals more specifically with the increasing need for potash in the Midwestern states where only a relatively few years ago the rich new soils were believed to contain inexhaustible supplies of this plant-food element.

"Millions of acres in ten of the most fertile states of the Middle West will hoist danger signals this summer on the crops they produce," this writer predicts. "These fore-runners of disaster must be heeded or this rich area will suffer the consequences of diminishing crop yields and declining crop quality.

"After a tour of inspection I have come to the conclusion that the ten central Corn Belt states are in urgent need of 1,500,000 tons of potash annually, in order to restore the potash that is being taken from the soil.

"I have seen these warning signals waving in the fields of these states. They are easy to recognize. Where the soil is low in potash the leaves of growing corn are fired along the margins, and yellow streaks appear between the veins. Stalks were weak, ears have soft cobs and chaffy grain; the whole field has a dull green look to it. Alfalfa shows its hunger for potash by the appearance of small white spots about the size of a pinhead on the lower leaves. Potato leaves roughen, pucker, curl up at the edges and turn yellow. Soybeans mottle and yellow, and the leaves of all other crops brown and wither where potassium is deficient.

"Only a veritable snowstorm of potash can sidetrack onrushing trouble. To move the amount of potash used up by each year's crops in these ten Midwestern states would require six trains of 50 cars, each carrying 25 tons of potash, running every day of the year except Sundays. To get an idea of the rate at which this valuable plant food vanishes, burn a shock of wheat or

a bushel of corn, and look at the amount of ashes. These ashes are soil that has been used by the crops. Thirty per cent of them is potash."

To further substantiate his observations, the writer says, "I asked soil scientists in states I visited how much potash is needed to replace the rapidly vanishing supply. Director C. A. Mooers, at the Tennessee Agricultural Station, advises 25 pounds to the acre for potash-deficient soils of his state. Dr. S. F. Thornton of Purdue University summed up the needs of Indiana at a like amount of potash for each cropped acre. Similar suggestions are offered for potash-deficient soils in other states.

"To supply 25 pounds of potash on every acre of cropped land in the ten Central states calls for the use of 1,500,000 tons of pure potash, 7,500,000 tons of 0-20-20 phosphate-potash fertilizer, or 25,000,000 tons of 2-12-6 nitrogen-phosphate-potash fertilizer."

To illustrate how far growers are from a realization of the losses taking place and the need for maintenance practices, he says, "Last year in the ten states which I investigated, farmers bought and applied around 60,000 tons of potash, only a little over one pound for each acre of cropped land. Twenty times that amount would not be too much."

Farm-soil Mapping

It is one thing to own soil and quite another thing not only to own it but to know it, even to the point of making a picture of it. Few farmers have gone to such thoroughness in the study of their resources as to have their soils mapped. Therefore additional credit should be given that already accorded Elmer Christenson of Fremont, Michigan, as being the first in Michigan to complete a 4-H club project in farm-soil mapping. He spent all of his available extra hours last summer mapping 13 fields totaling 160 acres, and incidentally became one of the best amateur soil-map makers that Michigan State College specialists have ever found.

Through cooperation with the county agricultural agent and members of the soil-conservation department of the college, the boy set up maps showing lime requirements of each field, made an erosion-survey map, a soil-type map, and a base map of the farm. Each one shows accurate outlines, fence lines, and measured areas differing within fields. He found that lime requirements range from none on six fields to a demand for 20 tons of marl for a field containing 9.4 acres. He set down 1936 and 1937 crop yields of the various fields so that results of future cropping and management changes can be measured.

Without doubt this young man has started a scientific as well as thoroughly practical understanding of the possibilities of increased profits from those 160 acres. Careful and planned management will follow, to the end that the soil which had the benefit of those "extra hours" will be enriched. If the wealth of our nation is in our soils, the completion of this project and the influence it may have on similar projects are contributions in keeping with those from many other important 4-H club projects which have attracted the nation's attention and commendation.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Pasture Fertility," Agr. Ext. Serv., Urbana, Ill., Mimeo. AG-531, Jan. 13, 1938, F. C. Bauer.

"Nitrogen—The Major Cause in the Production of Spotted Wheat Fields," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 43, Oct. 1937.

"Effects of Superphosphate Upon the Yield and Earliness in Maturity of Cotton," Agr. Exp. Sta., Raleigh, N. C., Bul. 314, Nov. 1937, C. B. Williams, T. S. Buie, and S. V. Stacy.

Soils

¶ A number of excellent publications prepared by agricultural leaders in several States depict how the Agricultural Conservation Program for 1938 offers farmers much needed information on restoring the fertility of their land, protecting it against the abuses of erosion, cropping systems that exhaust the soil, and adjusting the production of cash crops to meet consumer's requirements.

Typical of these is North Carolina Agricultural Extension Circular 219, entitled, "S—O—S" (Save Our Soil) giving valuable suggestions of the State Extension specialists for farmers to carry out in building up their farmland while earning their payments. "To obtain the full payment, credit is allowed toward the soil-building goal for certain soil-conserving practices, agreed upon by the committee and the farmer as being best suited for each individual farm. The practices counted toward this goal include most of those for which direct payments were made in 1937, such as growing legumes and winter cover crops, liming, applying potash and superphosphate, improving pastures and woodlands, and terracing." The new program will count each practice as a certain number of acres toward the acreage set up as the soil-building goal. Deductions from the farmer's payment will be made where he falls short of reaching the goal on each acre.

Specific information on what constitutes a sound soil-building program is interpreted in simple language by the crop experts.

"Soils of Judith Basin County, Soil Reconnoissance of Montana, Preliminary Report," Agr. Exp. Sta., Bozeman, Mont., Bul. 349, Dec. 1937, L. F. Gieseker.

"Soil Erosion Survey of Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 354, Feb. 1938, Austin L. Patrick.

"Soil Conservation, A Philosopher's Viewpoint," Agr. Ext. Serv., Burlington, Vt., Cir. 97, Jan. 1938, George Dykhuizen.

"Soil-Building Practices Applicable in Massachusetts," U. S. D. A., AAA, Washington, D. C., NER-203-Mass., Dec. 11, 1937.

"Soil-building Practices Applicable in Vermont," U. S. D. A., AAA, Washington, D. C., NER-203-Vt., Jan. 15, 1938.

"Soil Survey of Greer County, Oklahoma," U. S. D. A., Washington, D. C., Series 1932, No. 21, Oct. 1937, A. W. Goke and R. E. Penn.

"Soil Survey of Boyd County, Nebraska," U. S. D. A., Washington, D. C., Series 1933, No. 9, Oct. 1937, W. J. Morgan, F. A. Hayes, and R. H. Lovald.

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Crops

¶ Alfalfa is easier to start and is more productive on good fertile soils, but if carefully limed, inoculated, and fertilized, it often does well on land that is far from rich, according to J. B. R.

Dickey in Pennsylvania Agricultural Experiment Station Circular 180, "Growing and Harvesting Alfalfa in Pennsylvania." In any event, the soil must be well-drained. If the soil requirements are properly satisfied, good crops are made under the cool and humid conditions that prevail in the East, even though the crop is especially adapted to a warm and semi-arid climate. The only climatic handicap of the Eastern grower is greater trouble with grass and weeds which results in shorter lived stands.

Unless the soil is sweet it is not worthwhile to attempt to grow alfalfa. Soils having a very high lime requirement should be seeded to more acid-tolerant crops, and moderate amounts of lime applied for several years so as gradually to decrease acidity to a point where alfalfa can be grown. The crop does best on soils that have been deeply sweetened by repeated limings. Neglect of proper inoculation very frequently is the cause of alfalfa failure. Using pure cultures of inoculants is the easiest method of inoculation.

Like other legumes, alfalfa responds most strongly to phosphoric acid and potash. If properly inoculated, the crop can supply its own nitrogen after becoming well established. An application of about 400 pounds of a fertilizer carrying 2 to 4 per cent nitrogen and good percentages of phosphoric acid and potash is advised when seeding without a nurse crop on land which is not especially fertile. Where sown with winter or spring grain, the grain should be well fertilized. Where stands are to be mown for some years it seems very profitable to top-dress with phosphate or phosphate and potash. The fertilizer applied to the grain or the new seeding should be adequate for the first year or two that the alfalfa is mown. Later, an application of 300 or 400 pounds of superphosphate, 0-12-5, 0-10-10, or similar material put on in the spring or after harvesting has sometimes shown marked stimulation to growth and production and has also greatly reduced the amount of winter injury.

Other practical information on time and methods of sowing the crop, time of cutting, curing, pasturing, and alfalfa to control obnoxious weeds are given in the publication.

¶ E. C. Westbrook sums up the pertinent details involved in the production of Sea Island cotton in southern Georgia in Agricultural Extension Circular No. 268, entitled "Sea Island Cotton Culture." Because of the recent fair prices and favorable yields secured, considerable interest in reviving this almost extinct industry in the old Sea Island belt is being manifested. There are still the same obstacles standing in the way of the success of this crop that caused its virtual disappearance a few decades ago, notably, the boll-weevil, purity of strain, etc. Pure seed of a superior strain of Sea Island cotton is the first essential in its successful production, the author points out. The seed must be kept pure from harvest to planting time. Furthermore, plantings should be isolated at least a mile from upland cotton to prevent cross pollination, and the cotton ginned where only Sea Island is hauled to prevent possible mixture with other seed. The simplest, most practical, and economical way to produce this type of cotton may be through community cooperation.

It is believed by the author that the methods of land preparation and fertilization which give satisfactory results with upland cotton should also be suitable for Sea Island cotton. Good judgment will be the farmer's best guide. From 300 to 500 pounds of a 3-9-5 fertilizer applied before planting should give good results. An application of a nitrogen-potash top-dresser at chopping time should be profitable on sandy land. Instructions on the preparation of the seed before planting, cultivation, weevil control, and handling the crop are also given in the Circular.

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"Vegetable Gardening in Georgia," Agr. Ext. Serv., Athens, Ga., Bul. 462, Feb. 1937, R. L. Keener.

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Economics

¶ H. R. Kraybill, State Chemist and Seed Commissioner at Purdue University, in his annual fertilizer report, gives 226,887 tons of commercial fertilizers as the total sold to Indiana farmers during the year 1937. Detailed tables covering 221,187 tons and showing the spring and fall tonnages of each analysis sold are provided. It is estimated that 5,700 tons were sold by companies not reporting their individual analyses. The total tonnage represented by tag sales was 274,640 tons. This suggests two possibilities—that fertilizer companies doing business in Indiana were over-optimistic with respect to expected volume, or that some companies failed to report

their entire sales. However, the compilation is extremely useful and provides a very good year-to-year comparison of fertilizers sold in the State.

The leading analysis, according to the tables, is 2-12-6, representing 103,239 tons of the total reported, or 47 per cent of the total sales. The next most important grade was 0-12-12, with 12,307 tons. Other analyses constituting significant tonnages were 0-14-6, 0-20-20, 0-10-10, 4-24-12, 3-12-12, 2-8-16, 2-8-10, and 2-12-2. The sales in Indiana were very evenly divided between spring and fall, 110,787 tons being reported for spring and 110,400 tons reported as fall sales.

Even though tag sales were about 20,000 tons less in 1936, the total tonnage reported was greater than in 1937 by approximately 17,000 tons. In 1936 it was reported that 103,725 tons were sold in the spring and 134,665 tons in the fall. In that year 2-12-6 constituted 45 per cent of the total, and the next leading analysis was 2-12-2.

¶ According to the recent publication of the Massachusetts Agricultural Experiment station, Control Series, Bul. No. 90, "Inspection of Commercial Fertilizers," by H. D. Haskins, fertilizer sales during the 12 months ending July 1, 1937, exceeded the same period in 1935-36 by about 10,000 tons, the respective tonnages being 74,274 and 64,481. Of the total sales in 1936, 48,527 tons were in the form of mixed fertilizers and 24,004 tons were chemicals and materials unmixed, the balance of 1,743 tons pulverized and natural manures. Plant-food sales in 1936-37 were 4,163 tons of nitrogen, 6,540 tons of phosphoric acid, and 4,333 tons of potash, as compared to 3,659 tons of nitrogen, 5,419 tons of phosphoric acid, 3,816 tons of potash the year previous.

The leading grades in this State are 5-8-7, 4-8-4, 4-8-7, 7-6-6, 6-3-6, 4-8-10, and 4-8-8, with 5-8-7 heading the list with 14,206 tons. Only 901 tons of the mixed fertilizer sold within the State contained less than 14 per cent available plant-food.

¶ Even though the fertilizer industry is still in its infancy insofar as the State of Minnesota is concerned, a rather complete and useful report covering fertilizers sold in Minnesota is published by the State Department of Agriculture, Dairy and Food. According to the 1937 report, 12,385 tons of commercial fertilizers were sold within the State, of which 5,813 tons contained all three of the major plant foods, 50 tons contained only nitrogen and phosphorus, and 3,160 tons contained only phosphorus and potash, while 2,571 tons were phosphate fertilizers, the balance being small tonnages of organic, nitrogenous, and potash fertilizers. The 1937 tonnage compared to 9,898 tons in 1936, 10,776 tons in 1935, 9,165 tons in 1934, 7,256 tons in 1933, 9,319 tons in 1932, and to the peak year 1931 of 17,697 tons. In 1937 about 264 tons of nitrogen, 2,022 tons of phosphoric acid, and 1,236 tons of potash were consumed in Minnesota fertilizers. This compares with the peak year 1931, when 402 tons of nitrogen, 2,581 tons of phosphoric acid, and 1,772 tons of potash were consumed. According to the report, by far the greater part of the fertilizers used in Minnesota is sold in the spring.

¶ The Pennsylvania Department of Agriculture in General Bul. No. 547, Fertilizer Report for 1936 state that according to the 1936 applications for registration, 295,048 tons of all classes of fertilizer were sold during the year 1935, which compares to 267,987 tons sold during 1934. In 1936 licenses were issued to 123 different manufacturers, covering 954 brands of which 727 were mixed fertilizers and 227 were for base materials. Of the total tonnage sold in 1935, 214,333 tons were complete fertilizers, 52,890 tons were superphosphate fertilizers, and the balance included small tonnages of other types. It is estimated that in 1935 about 6,800 tons

of nitrogen, 32,959 tons of available phosphoric acid, 13,707 tons of potash, or a total of 53,466 tons of plant food were supplied to Pennsylvania farms in the form of commercial fertilizers. This was 47,806 tons more than was contained in the 1934 tonnage. In commenting upon the results of official samples analyzed in 1936, it was noted that approximately 8 per cent were found to be deficient in one or more elements of plant food to the extent of .2 per cent. However, proportion of deficiency was lower than in the year 1935.

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"Grade and Staple Length of Cotton Produced in Louisiana, 1928-34," U. S. D. A., Washington, D. C., Oct. 1936, W. B. Lanham, C. C. McWhorter, and I. M. Skinner.

"Quality of Cotton Ginned in Mississippi, Crops of 1928-34," U. S. D. A., Washington, D. C., Feb. 1937, W. B. Lanham, F. H. Harper, and Marguerite Dodson.

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Pat—"What do you charge for a funeral notice in your paper?"

Editor—"Fifty cents an inch."

Pat—"My Heavens, man, my poor brother was six feet tall."

"Men who don't play golf don't know what they're missing," says an enthusiast. Many men who do play golf know perfectly well what they are missing, and still can't hit it.

Theory and Practice in The Use of Fertilizers

IN STRIDE with the phenomenal progress in the manufacture and use of fertilizers during the past decade is the thoroughly revised edition of "Theory and Practice in the Use of Fertilizers," by Dr. Firman E. Bear, formerly Professor of Agricultural Chemistry and Soils, Ohio State University (John Wiley and Sons, Inc., New York, $4.00). Like the preceding edition, this new book is a broad treatise on subjects pertaining to the science of soil improvement through the efficient use of fertilizers. The simplicity in style employed by Dr. Bear in the text arrangement adds a great deal to the readability of this book.

Historical Approach

Before one clearly understands the numerous theories involved in the study of the science of soil fertility, it is imperative to reminisce through the early pages of history to grasp the real concept of our modern principles. This Dr. Bear skillfully does in the introductory chapters. At the end of each of the 20 chapters comprising the book are found a number of selected references from eminent authorities who lent outstanding contributions to the subjects with which the various chapters deal. While the general scope of the new book is somewhat the same as the previous ones, several chapters are entirely rewritten to conform with the more recent investigational findings, and a chapter on "trace" elements is added. This new edition thoroughly covers the advancements made in the fertilizer industry. Among these are the recent developments in the domestic production of potash and other chemical fertilizers.

The author is conscious that much still remains to be done before a really scientific use of fertilizers will be possible. Scientific research is continually adding to newer concepts of soil improvement by means of artificial fertilizers. Many of our comparatively recent beliefs have been altered or disproved. Experience has shown us that it is impractical to gather all the needed nitrogen from the air through growing legumes as some formerly believed feasible. Likewise, the use of the cheaper forms of phosphate as phosphate rock is now recognized to be less economical for most of our soils than was previously contended. And the author points out that Hopkins and his followers were in error with reference to a number of points in theory concerning the ability of the soil to supply potash for plant growth. The minor elements were once considered "plant poisons," because when used in more than small doses they were likely to be injurious to crops. Soils over wide areas are at the present time so deficient in one or more of these "trace" elements that they must be used in some form to avoid crop failure.

Reference Manual

In the chapters dealing with these and the related topics, the reader is given much valuable information that will serve a useful purpose in the growing of economical yields of the standards crops. This book is a splendid reference manual for students and everyone concerned with fertilizer theory and practice.

"We Are Growing Into, Not Outgrowing, Age of Wood"

"We are not outgrowing the age of wood," says the United States Forest Service. "In fact, according to present indications, we are only growing into it."

At the Forest Products Laboratory, maintained at Madison, Wis., by the Forest Service for research into the problems of wood utilization, scientists are testing the practicability of prefabricated houses of wood, to be built by mass production in factories and erected complete in a week or less. The laboratory also is improving methods of making joints and fastenings so that timbers can be used more efficiently for bridges, arched halls, and hangars.

Is Renewable

"One of the advantages of wood as a raw material," says Dr. Warren D. Brush of the Division of Forest Products, "is that it is renewable. With sound forestry we can grow successive crops; we can keep up the supply forever."

About 50 billion board feet of wood is used in the United States in an average year. To better visualize what that means, Dr. Brush used a boardwalk 40 feet wide and an inch thick as a yardstick. Fifty billion board feet would be enough to make such a walk as long as the distance from earth to moon.

More than one-half this wood goes into building construction. The second largest use of wood is for fuel. Millions still rely on wood to heat their homes and cook their meals. A most important use of wood is paper for books, magazines, and newspapers. The United States uses more than 4,000,000 tons of newsprint a year—200 pounds for each person.

"Newsprint, however," says Dr. Brush, "uses only about one-third of the wood-pulp production. The rest comes from the mills in myriad forms—as writing paper, as cartons for cereals, butter, ice cream, and hundreds of other products; as paper napkins, cups and plates; and as paper sacks, an unending list of articles used daily to cushion the rough angles of existence. Experts predict that by 1950 we will be using, for all purposes, 25,000,000 tons of wood pulp annually—twice our present consumption."

Truck-crop Farming in Mississippi

(*From page* 22)

The mixtures most commonly used in the trucking area are 3-8-5, 4-8-4, and 4-8-8. In special areas of the State where 4-10-7 and 4-8-8 have been used altogether for potatoes and watermelons, the 4-8-8 will largely be used. It was agreed that this mixture was just as well adapted for these crops and at the same time was slightly cheaper.

Both farm experience and agricultural research indicate that truck crops in general should be fertilized with a high-grade complete fertilizer analyzing from 4 per cent to 8 per cent potash. Also that the 4-8-8 is the mixture to be used on crops where the 4-10-7 has been used heretofore.

Most of the tomato crop and a large

portion of the cabbage crop are grown on small bottoms or valleys and second bottoms, as these soils contain more moisture. On most of these soils, as well as on the more sandy soils, farmers can use the maximum amount of potash recommended.

Of general interest is the wide distribution of tomatoes and cabbage. The Bureau of Agricultural Economics reported that in 1937 tomato shipments were made to 198 cities in 32 States and the District of Columbia and Canada. States leading in purchases of tomatoes included Pennsylvania, New York, Illinois, Massachusetts, Michigan, and Virginia.

Cabbage was shipped in carlots to 149 cities in 33 States and Canada. Cities taking the largest volume of tomatoes were New York, Philadelphia, Pittsburgh, Detroit, Baltimore, Cincinnati, Montreal, St. Louis, Washington, Nashville, Toronto, Indianapolis, Louisville, and Memphis.

Corn Can Be Grown on "Frenchy" Soil

(*From page* 20)

almost a standard practice. Usually a complete fertilizer is used, but it was found that none of the mixtures available carried what was regarded as enough potash, so they were built up by the addition of a quantity of one of the potash salts.

In order to determine the plant-food requirements of corn on this soil type as accurately as possible, a demonstration was arranged last year with J. B. Clayton, a prominent farmer of Falkville, with FFA Chapter of the Falkville High School cooperating. It is perhaps more proper to call the test which was conducted an experiment, because the most uniform soil available was selected, the land was measured accurately, the fertilizer was weighed carefully, and the yields were recorded properly.

Appearance of the crop was observed throughout the growing season, and it was noted that plots which received potash had a dark-green color and gave every indication of normal development. On the other plots the corn was yellow and under-sized, and presented a marked contrast in appearance. As the plants neared maturity, those which did not receive potash began to fall down, and nearly half were on the ground at harvest time. The accompanying photograph shows two of the plots as they appeared just before the corn was gathered.

The treatments of the various plots and the per-acre yields are as follows:

Plot No.	*Treatment*	*Amount per acre*	*Yield*
1	Muriate of potash	100 lbs.	28.0 bus.
2	Muriate of potash	100 lbs.	31.9 bus.
	Nitrate of soda	200 lbs.	
3	Nitrate of soda	200 lbs.	14.4 bus.
	Superphosphate	200 lbs.	
4	Muriate of potash	100 lbs.	33.8 bus.
	Nitrate of soda	200 lbs.	
	Superphosphate	200 lbs.	
5	Nitrate of soda	200 lbs.	17.5 bus.
6	No fertilizer		16.9 bus.
7	Superphosphate	200 lbs.	27.6 bus.
7	Muriate of potash	100 lbs.	

It is our purpose to continue this experiment with perhaps the addition of plots in which higher amounts of potash are used. The possibility that larger applications might be profitable was apparent when it was observed that complete control of lodging was not obtained with the amount used in this test.

Closely associated with the Hollywood soil in this section of the State in its apparent plant-food requirements is the Colbert series. While the latter is adapted to a greater diversity of crops, demonstrations and experiments indicate that the response to the different fertilizer elements is very similar.

A Primer Explaining Cotton Disease Control

(*From page* 19)

of cotton seedlings, so that they may just as promptly as possible push through the soil and grow out of the susceptible seedling stage. This can largely be brought about by first putting soil in as good a condition of tilth as possible with a mellow, warm seedbed, and second by avoiding excessively early planting. Waiting until the soil warms up sufficiently to allow prompt germination and rapid emergence may make all the difference between a ragged stand or no stand at all and a perfect one.

Seedling Diseases

Recently other methods of combating seedling diseases have been devised. The de-linting of cotton seed with sulphuric acid not only disinfects the seed but also promotes rapid water absorption and prompt emergence. This treatment has found greatest acceptance in the irrigated sections of the Southwest, as a control for seedling diseases and also for the control of angular leaf spot of cotton. In cool weather and in soggy, wet soils, acid de-linted seed has not always given complete satisfaction.

The use of organic mercury dusts has become increasingly popular, particularly in the more easterly cotton States, for the control of seed borne diseases of cotton, such as angular leaf spot, and also for the control of soil borne parasites, and has given excellent results both with respect to the control of seedling blights and angular leaf spot. In all probability this measure should prove of benefit when cotton is to be planted early, especially in heavy soils and when serious outbreaks of angular leaf spot and boll rots have occurred the previous season and the seed is either badly contaminated with disease germs or is of low germinative power. Combinations using acid de-linted seed or machine de-linted seed and organic mercury dust are promising measures for the control of seedling blights, angular leaf spot, and boll rots.

As has been previously said, Fusarium wilt, "rust" or potash hunger, and root-knot or nematode disease form a trio of highly destructive diseases commonly prevalent in some of the best, sandy alluvial cotton soils of the South. Nearly 50 years ago Doctor George F. Atkinson of the Alabama Experiment Station, one of the great trail-blazers in the study of cotton diseases, discovered that the true cause of cotton wilt was a fungus which penetrated the water tubes of the roots and stem from the soil. He reported also that when root knot or nematode disease with its swollen, unsightly roots is present, cotton roots become greatly weakened and highly susceptible to attacks of the cotton-wilt fungus. This finding has been amply and repeatedly verified since that time, and it is now recognized that when soil is badly infested with the root-knot disease, the nematodes must first be eradicated from the soil before any of the other measures devised for the control of cotton wilt will be successful.

Nematode Control

Unfortunately, no adequate method of getting rid of nematodes on a large scale has been found except by starving them out of the soil through a rotation of at least 2 years, using some nematode-resistant crop. This method will be successful only if clean cultivation is practiced, since many of the common field weeds are susceptible to the root-knot disease and serve to maintain the soil infestation. Crops useful for such a rotation will vary with conditions and the part of the country

concerned. Some of the important resistant crops are small grains, corn, sorghum, Iron, Brabham, Victor and Monetta cowpeas, Laredo soy beans, peanuts, and crotalaria. Experience has further shown that it is wise to avoid extremely susceptible crops, such as Whippoorwill cowpeas, in cotton soils even if traces of root knot are present, since the soil is apt to become so heavily infested with the nematodes that cotton cannot be grown there successfully for several years.

Potash Hunger

If root knot has not been present previously, or has been largely eradicated by the proper rotation, the next consideration should be the question of "rust" or potash hunger. This disease of cotton is widespread in the sandy soils of the cotton belt and in that part of the cotton area adjoining the Mississippi River and has been shown to be commonly a factor in greatly increasing the severity of cotton-wilt attacks. Whether or not "rust" is associated with cotton wilt, it is itself a serious disease which must be controlled before cotton will do its best.

The yellowing and reddening of cotton leaves, early dropping of the foliage, and premature death of cotton plants, accompanied by failure of the top bolls to mature, which are characteristic of "rust" or potash hunger, all signify a profound upsetting of the normal processes going on within the cotton and cannot fail to greatly reduce the yield and quality of the cotton crop. Fortunately potash hunger can, in the large majority of cases, be completely controlled by the use of potash-containing fertilizers, the actual amount necessary varying greatly with local conditions. In Arkansas, where this problem has been studied for many years, it has been shown that relatively high amounts of nitrogen and phosphate with low amounts of potash may be of little benefit for the control of either "rust" or cotton wilt, and that unbalanced applications without any potash at all may actually greatly increase the severity of both "rust" or potash hunger and cotton wilt. On the other hand, well-balanced mixtures or potash alone have given excellent control of both "rust" and cotton wilt.

The building up of the humus of the soil through the use of green manures has been shown to have highly beneficial effects with respect to cotton "rust." On the other hand, repeated removal of potash from soil through harvesting of leguminous crops for hay over a period of years often so completely upsets the balance of fertilizing elements in the soil that it greatly intensifies the severity of potash hunger and cotton-wilt attacks.

The cotton-wilt disease is widespread in the coastal plains regions and in the sandy alluvial river valley soils of the cotton belt. Injury varies from mere traces to practically complete losses. This latter condition most often results when highly susceptible cotton varieties, such as Half and Half, Acala, or Mebane are planted on nematode-infested or potash-deficient soils.

Cotton Wilt

As has been previously mentioned, attacks of the root-knot nematode seriously damage cotton roots and render them highly susceptible to invasion by the cotton-wilt fungus. In planning a control program for the cotton-wilt disease, it must be recognized that cotton wilt cannot be successfully controlled unless root knot or nematode disease has been controlled. Further, it should be remembered that in parts of the States of Arkansas, Mississippi, and Tennessee, and in certain other localities, it has been shown definitely that the control of potash hunger through the use of potash-containing fertilizers greatly reduces the incidence and severity of the cotton-wilt disease. Consequently,

Control of cotton wilt and "rust" or potash hunger through the application of muriate of potash. At the left only acid phosphate was used. All plants were severely affected with "rust," and more than 40% showed cotton wilt. At the right, perfect control of potash hunger and only a trace of cotton wilt as the result of applications of muriate of potash alone. Note that the foliage is in perfect condition and that the top bolls are maturing and opening well. On soil as "weak" as this, much better results were secured when potash was a part of a well-balanced mixture.

in many localities it is also necessary to plan a system of balanced fertilization with potash-containing fertilizers as a part of the program for cotton-wilt control.

Finally, having provided for the control of root knot and "rust" or potash hunger, cotton wilt control also requires the employment of a cotton variety suitable to one's particular locality; a variety which is sufficiently resistant to the cotton-wilt disease that when the other factors mentioned above (i. e., the control of root knot and rust) have been taken care of, the incidence and severity of the wilt disease is reduced enough to make losses unimportant. This does not mean that the most resistant variety available need always be employed since, under many conditions, varieties which are only moderately resistant, such as Arkansas Rowden 40, 2088, or 4056 possess sufficient resistance and are otherwise better suited to certain conditions, giving them preference to more resistant varieties. However, under the more severe cotton-wilt conditions particularly of many coastal plains areas, the most resistant variety available is none too resistant. Here strains of Dixie 14, Dixie Triumph, Cook, Clevewilt, and similar varieties are needed. In general it may be said that there are wilt-resistant varieties suitable to every cotton section of the South where cotton wilt is present and that there is no need to use susceptible varieties of cotton, such as Half and Half, Delfos, Acala, Mebane, and the like where cotton wilt is sufficiently serious to cause commercial losses.

Summarizing briefly, we may say that cotton disease control requires first careful observation in previous years so that one may know rather definitely just what diseases are causing losses. If root knot is one of them, a rotation looking toward its elimination is necessary. Second, the grower must lay careful plans for the use of proper wilt-resistant varieties, the nec-

essary fertilization, and the required seed treatments before the rush of the planting season. Finally, he must resist the temptation of excessively early planting and must, so far as possible, prepare a warm, mellow, seed bed which will encourage prompt germination and emergence and rapid growth out of the susceptible seedling stage. Let it be emphasized again that after the seed is planted it is too late to start a cotton disease control program.

Soil Tests Improve Canning Crops

(*From page* 18)

TABLE I

Plot	pH	NO_3	Ca	Mg	P	K
1. Standard fertilizer, surface	6.8	M+	H	H	H	VL
Standard fertilizer, subsoil	7.0	M+	H	H	H	VL
2. Check, surface	6.8	M+	M	H	H	VL
Check, subsoil	6.6	M	L-M	H	H	VL
3. Extra potash, surface	6.8	M+	M	H	VH+	VL
Extra potash, subsoil	6.6	M	L-M	H	VL	VL

VL—very low; L—low; M—medium; H—high; VH—very high.

extra potash were a darker green and were more vigorous but showed, on an average, only one set of fruit per plant, whereas the plants on the plot with the standard fertilizer treatment were smaller, a lighter green color, and had two or more "sets" per plant.

As the season progressed the plants on the extra potash plot retained their vigor, and the leaves remained green until they were killed by frost, while the leaves on the other two plots died early in September.

The writer in company with the farm manager made a careful survey of the plots on September 14. Although yield records were not taken, the maturity and quality of the fruit and approximate percentage of diseased fruits were noted. At this time, plot 1 showed 60 to 70 per cent infestation of Phoma and bacterial soft rots, few green tomatoes, a large percentage of rough fruits, together with a considerable amount of "leather end." The check plot showed somewhat less disease and fewer rough or cull tomatoes. On the other hand, the extra potash plot showed 5 to 10 per cent green tomatoes, very little disease, larger and much more uniformly sized fruit.

The accompanying photograph shows representative samples of fruit taken from the various plots. Soil samples were taken at the end of the season, and the results of rapid tests are given in Table II. Because the extra potash had been applied as a surface application, it was considered desirable to sample the surface layer at a depth of 1 to 4, and 4 to 7 inches to determine whether or not it had penetrated to the full depth of the

TABLE II

Plot	NO_3	Ca	Mg	P	K
1. Standard fertilizer, 1—4"	trace	L-M	H	H	L
Standard fertilizer, 4—7"	trace	L-M	H	M	L
2. Check, 1—4"	trace	M-H	H	L-M	L
Check, 4—7"	trace	M-H	H	M	VL
3. Extra potash, 1—4"	trace	L-M	H	H-VH	M
Extra potash, 4—7"	trace	L-M	H	H-VH	M

surface soil. For the sake of uniformity all three plots were sampled in the same way.

The tests at the end of the season show that the soil from the plot receiving potash in addition to the standard fertilizer had the available potash supply considerably improved in spite of the heavy crop produced. In view of the improved quality of the fruit and freedom from disease on this plot, it would appear that for potash-deficient soils in this locality, larger amounts of potash in the tomato fertilizer are necessary to meet soil and crop needs.

Out of the Wealth of Our Soils

(*From page* 11)

grain, but in spite of drought and excessive heat there was a remarkable response to the fertilizer. Tabulated below are the results of this demonstration.

that the straight phosphate treatment had accentuated the potash hunger in the alfalfa on this plot. The alfalfa plants were dwarfed and stunted, and showed not only the early symptoms

1936 RESULTS

Treatment	Rate per acre	Yield per acre grain	Yield per acre straw	Bushels increase grain	Pounds increase straw	*Value of inc. grain + straw	Cost of fertilizer	Net profit per acre
Check	.....	10.5 bu.	472 lbs.	.....	.....	....	....	....
0-20-0	225 lbs.	16.8 bu.	870 lbs.	6.3 bu.	398 lbs.	$4.74	$2.75	$1.99
0-20-20	225 lbs.	23.4 bu.	1,020 lbs.	12.9 bu.	548 lbs.	8.64	5.25	3.39

* Oats valued at 50c per bushel. Straw valued at $8.00 per ton.

However, the residual benefit to the alfalfa and timothy hay crop in 1937 gave us our biggest surprise. On the plot which had received the 0-20-20 treatment there was a good crop of hay, but where no fertilizer had been applied (lime only) the crop of hay was very poor—in fact, a mangy, potash-hungry, sorry looking sight. Where superphosphate alone had been applied the alfalfa was but little better, although the timothy seemed to be a somewhat heavier crop than on the check plot. It was strikingly apparent of potash starvation, but dried up prematurely. Following is a tabulation of the results in 1937 and the total net value of the increases for 1936 and 1937.

From the above data it will be noted that there has been a net gain of $16.72 over and above the cost of the fertilizer, and there should be still further benefits in 1938 and 1939, if the alfalfa does not winter-kill. Furthermore, the heavier growth of alfalfa will add more nitrogen to the farm; the extra tonnage of alfalfa will make

1937 RESULTS

Treatment	Yield of alfalfa	Increase	*Value of increase	Total net value of grain and alfalfa increases
Check	1,777 lbs.	.....	....	....
0-20-0	2,444 lbs.	667 lbs.	$4.00	$5.99
0-20-20	4,000 lbs.	2,223 lbs.	13.33	16.72

*Alfalfa valued at $12.00 per ton.

more manure which will add to the fertility of the farm as a whole.

I am positive that the results recorded above can be duplicated on thousands of farms in this north-central area. In fact, hundreds of such demonstrations have been conducted on a wide range of soils scattered over southern, central, and north-central Wisconsin during the past few years, and they all tell the same story—perhaps not in quite as spectacular a way as noted in this Colby soil area, but it is strikingly apparent that our soils are wearing out, that our feed shortage problems are vitally associated with waning fertility.

Residual Profits

Fifty-one demonstrations were set up last year (1937) on small grain (many of the fields seeded to alfalfa and clover). In 49 out of the 51 demonstrations the increase in the yield of grain more than paid for the fertilizer, and the entire cost of the fertilizer was charged against the grain crop. This is hardly fair, for we know that the residual carry-over on seedings or other crops will add further to the returns on the fertilizer in the 2 or 3 years following. In most all of these 51 demonstrations we made a direct comparison of 20 per cent superphosphate with a mixture carrying potash. In a high percentage of cases the plots receiving potash in addition to phosphate not only gave larger increases, but the net return was greater. The benefits to the alfalfa and clover crop in 1938, and perhaps 1939 and 1940, will add further to the benefits from potash, since alfalfa and clover are heavy feeders on potash.

And so the influence of all of our work for the achievement of a sound soil improvement program will in time bear fruit and may be compared, I believe, to the influences of a good home, good environment, high ideals and education on our children of this generation, on the future citizenry of this country. We all know that by and large our efforts will have a profound influence, that if we keep talking, thinking, working, and striving for the accomplishment of our desires for good, in time we shall achieve our aims. A quotation to which I frequently refer, the thought of which was dramatically told in Hawthorne's story, "The Great Stone Face," is expressed in the following words by James Allen, "The vision that you glorify in your mind, the ideals you enthrone in your heart, this you will build your life by, this you will become."

Safeguard Fertility of Your Orchard Soils

(*From page* 16)

sufficient for trees accustomed to much more. This was no doubt an important factor in the injury experienced here in 1930.

"It is notable, however, that on deep soils in good physical condition, capable of storing a large reserve of moisture from late fall and winter precipitation, trees of all varieties withstood the drought without injury. In some instances heavy crops of fruit of good size and good color were matured. The drought has thus emphasized the lack of soil moisture-holding capacity as one of the greatest inherent weaknesses of orchards of this region.

"The orchards suffering most from this are on high ground or on hillsides where erosion has worn the soil thin, on shallow shales, and on limestone soils made shallow in places by the outcropping of rock. A few instances of injury were observed on deep, low lying soils with a high water table in which, however, in normal years abundant surface moisture from drainage

of the higher surroundings had encouraged shallow rooting. When the trees in one such location were removed late in 1931, the root systems were observed to be very shallow and very small in proportion to the tops of the trees."

Similar observations were made throughout Virginia. It was almost a parallel in the association of these Batjer for the Pittsburg meeting of the American Society for Horticultural Science in 1934. These data are presented herewith as Table II. They show that in 22 cases out of 24 in one group and 13 out of 18 in the second, or 35 cases in 42, no winter injury occurred in the soils with the higher per cent of organic matter.

Further instances indicating injuries

TABLE II. Relationship of Per Cent Loss on Ignition in the Hoosic Soil to Root Injury of Young Apple Trees During the Winter of 1933-34.

Group 1			Group 2		
Pair No.	Uninjured trees in row 9 (Former fence row)	Nearest dead tree	Pair No.	Uninjured trees other than row 9	Nearest dead tree
	1	2		3	4
1	5.53	5.00	1	5.24	4.15
2	5.87	5.25	2	5.31	5.01
3	5.41	4.10	3	6.10	5.39
4	6.13	5.39	4	3.58	4.64
5	5.79	5.44	5	4.28	4.07
6	5.62	5.92	6	5.08	4.43
7	5.86	4.80	7	3.73	4.64
8	5.38	4.06	8	5.65	4.90
9	5.58	4.63	9	3.84	3.20
10	5.45	4.55	10	3.56	2.86
11	5.37	3.79	11	3.74	3.59
12	5.75	4.08	12	5.13	4.30
13	5.12	3.92	13	5.23	5.24
14	5.32	4.03	14	5.17	4.95
15	4.69	3.82	15	5.45	3.94
16	4.80	4.16	16	3.72	3.44
17	4.06	4.08	17	5.23	4.64
18	4.35	4.21	18	4.92	4.94
19	4.60	3.69			
20	4.38	3.91			
21	4.10	3.14			
22	4.04	3.98			
23	4.65	4.18			
24	5.50	4.53			

weaker, drought-injured trees and the still more serious injury and even final demise due to the subsequent low winter temperatures. The vast majority of trees that were unable to survive the following winter were those principally weakened by the previous summer drought. The more vigorous trees, particularly those in situations abundantly supplied with soil humus, came out with very little apparent injury. A very convincing set of observations, bringing out the effectiveness of soil humus in mitigating against winter injury, appeared in the data of a paper prepared by Dr. L. P.

during the winter in soils low in humus are contained in the observation reported last year, 1936, by Anthony, Sudds, and Clarke of Pennsylvania. They report "A higher percentage of trunk injury on both apples and peaches was seen in an orchard along the Schuylkill River below Reading. Here excessive cultivation has resulted in heavy erosion and a low state of fertility in the orchard. The only factor which seemed to be associated with apple-tree winter injury was low vigor which was usually due to poor soil."

From the various observations made

Following one season of a 10-6-4 fertilizer combination at the rate of 10 pounds per tree, badly neglected trees of low vigor and little fruit production produced as high as 25 bu. per tree. The cost of this fertilizer is about 25c or 1c per bu.

here and numerous cases cited elsewhere,' it would appear advisable to get liberal amounts of humus into the orchard soil. How may the fruit grower best handle the orchard soil to maintain a liberal supply of such material?

Use of Ground Cover

Although orchard soils under clean tillage may show for some time much better results in tree growth and fruit production, there are for apple orchards some very decided advantages in a modified sod system of ground cover. The advantages of clean cultivation, even in a fairly fertile soil abundantly supplied with humus, especially in controlling competition from ground cover growth of weeds and securing aeration, are finally offset by many ill effects that develop with continued cultivation.

Where cover crops, sods, and mulches are utilized, there is greater reduction of rapid run-off of rainfall, reduction of washes due to erosion; and chances are better for greater penetration of rainfall with a greater retention of such moisture over a longer period. However, a very heavy, unbroken, or uncracked sod orchard cover as well as competing cover crops, especially during the development of fruit when the demands of trees for soil moisture are at their highest peak, have great disadvantages. Heavy unbroken sods also invite the fire and mouse hazard. But with some modification a system of maintaining a sod or ground cover can be made to give the best practical results, especially for apple trees 5 years and older.

Judging from the excellent results secured in the orchard plots conducted by the Virginia Agricultural Experiment Station around Blacksburg, Va., it would be very profitable for most orchardists to adopt those practices which bring about a system of growing strong, luxuriant ground-cover vegetation, subject to the greatest possible amount of control, should it compete seriously in any way with the fruit trees. It would be well to insure conditions for quick, rapid growth particularly through fall and early spring.

In many respects a careful system of growing rye will almost be sufficient, particularly when supplemented with other volunteer growth. Rye has many valuable advantages. It can be made to grow vigorously in the fall with a production of efficient, soil-binding roots. This crop is ready to grow with a rapid start early in spring. While it is making this rapid growth, the soil moisture needs of the apple tree are less rigid. Even in years of low spring precipitation, it has been found that a ripening rye crop is not

a very serious competitor with the fruit trees. As the rye crop ripens, its ability to compete with the stronger root-foraging powers of the trees progressively diminishes. Furthermore, a stand of rye as it develops through to a ripened crop is most admirably adapted to catch and prevent rain run-off. More generally gains made from such water retention to the fruit trees planted in such a crop are far greater than what is taken away from them by the rye crop.

Later in the season after ripening, this rye crop can easily be dragged down or disked, seed, straw, and all. Later a volunteer crop will come up. This mulch of rye straw is very effective in the summer retention of soil moisture and at the most critical growing and crop-developing period of the fruit tree. To get the most out of such a rye crop it should be liberally fertilized with a complete fertilizer. The writer has secured an excellent result with a 10-6-4 fertilizer.

A rye crop can also be supplemented with other ground cover crops of a perennial nature, especially those that may come up voluntarily in the fall. Among these are many of the common grasses and legumes which, under Virginia conditions, will soon develop into heavy sods if permitted. It is best, however, to discourage any tendency towards sod binding, even though all efforts should be employed to get quick, succulent, lush growth.

In the maintenance of orchard ground covers to get the most practical results in improving the water-holding properties of the orchard soil, no better provision can be made than using adequate amounts of fertilizers containing not only nitrogen but also phosphorus and potash. Agronomists far and wide give us an abundance of proof that such a fertilizer practice gives the greater yields. The experiments of Evans in Ohio with the fertilization of timothy meadows show a production of 3,731 pounds of air-dry hay for 120 pounds of nitrate of soda, 240 pounds of 16 per cent acid phosphate, and 80 pounds of muriate of potash to the acre. Comparing this to the adjoining plats receiving no phosphorus or potash but 120 pounds of sodium nitrate, the yield was 3,180 pounds of hay, and a 5-ton application of farm manure yielded 3,264 pounds of hay.

Results secured at the Virginia Agricultural Experiment Station also show higher yields where complete fertilizers are applied to various agronomic crops. Over a 22-year period, 1914-1936, the following results have been secured at this station near Blacksburg, Va.: 2.14 tons of clover hay per acre with NPK combination, as against 1.01 tons where only N was used, and 2.43 tons grass hay for NPK against 1.13 tons for N only. In these treatments 308 pounds of a nitrogenous source of fertilizer per acre were used. To this amount of nitrogenous fertilizer 438 pounds of acid phosphate and 200 pounds of muriate of potash were added for the complete fertilizer application.

Fertility Safeguards

Summarizing this discussion on orchard soil-fertility safeguards, it would be well to call attention to the following salient points:

1. For healthy, vigorous, and productive growth, it is absolutely essential that fruit trees be adequately supplied with nitrogen, phosphorus, and potassium in the soil.

2. Fruit trees deprived of nitrogen show up in such deficiency as follows: (a) terminal growth of young apple trees shows small yellowish-green leaves and reddish petioles which form narrow angles with the stem; (b) relatively small leaves with red pigmentation usually present on veins and petioles; (c) short and slender current growth of stem and twigs; (d) slender roots with yellowish cortex on new growth.

3. Fruit trees deprived of phosphorus show up in such deficiency as follows: (a) foliage abnormally dark green, especially the young leaves, older leaves tend towards mottling and appear lighter than the younger leaves; (b) usual tendency towards high, purplish-red pigmentation in both stem and leaves, especially near the ends of the twigs; (c) tendency of leaves to develop a tough texture and form abnormally sharp angles with the stems; (d) slender twigs; (e) tendency for the appearance of abnormally small, dark-green leaves and considerable purplish-red pigmentation on foliage and stem of the growing tips.

4. Fruit trees deprived of potassium show up in such deficiency as follows: (a) relative slender twig and stem growth sometimes in the absence of appreciable restricted linear growth; (b) tendency towards the development of relatively smaller leaves; (c) development of marginal leaf "dry-back" starting first on leaves growing on the lower half of the current stem; (d) with greater degree of marginal leaf "dry-back" newer leaves tend to become smaller and thinner than under normal conditions; (e) tendency toward root and twig "die-back"; (f) tendency of fruit to be subject to a greater degree of "spotting."

5. Under field conditions the greater direct profits come from the applications of the various nitrogenous fertilizers to fruit trees.

6. Under field conditions the more noticeable direct responses of fruit trees to complete fertilizers come after their fifteenth year and especially under conditions of root crowding.

7. Soil moisture control and retention by means of the incorporation of ample amounts of organic matter are of vital concern to all fruit growers. The best insurance in such orchard soil management is ample fertilization of the ground or cover crops with complete fertilizers.

When, How and Why Fertilize Your Lawn

(*From page* 8)

height of cut of 1 inch or longer, and reseeding with adapted grasses to repair injuries, constitutes the most effective method of controlling crab grass.

The following recommendations for feeding lawns have been devised for humid regions in the northeastern quarter of the United States, as the result of extensive tests conducted by the New Jersey Agricultural Experiment Station over a 10-year period.

Home gardeners frequently require advice on the need for uniform distribution of fertilizer over the lawn surface. Since fertilizers move downward into the soil and do not penetrate laterally, areas not actually covered by fertilizer derive no stimulating effect.

Kind of soil	Fertilizer analysis	Amount to apply lbs. per 1,000 sq. ft.	
		Early spring	Early autumn
Average to poor lawn soils	5-8-5 5-10-5 4-12-4	10 to 20 lbs.	10 to 20 lbs.
	15-30-15	3 to 7 lbs.	3 to 7 lbs.
Fertile soils, well supplied with phosphates and potash	8-6-4 10-8-6 10-6-4	5 to 10 lbs.	5 to 10 lbs.

Burning the turf with even the most concentrated fertilizers may be avoided by uniform distribution at a time when the grass leaves are completely dry. Applied in this manner, the material sifts through the leaves onto the soil, without injury to the turf. Artificial watering after fertilization is not essential where this practice is adopted.

Where the home lawn has failed, it will pay to inquire into the fertilizer practices. Turf grasses respond to rich, fertile, soil, and will endure much harsh treatment if properly fed with available plant nutrients during the cool seasons of the year.

On Being Domestic

(*From page 5*)

the west. To be sure, fried taters, ham and eggs, and murky coffee deprived me of vitamins, although I didn't know then what ailed me, thinking it was love or prairie fever. Tiring of this porky fare, I purchased a packet of hail-stone tapioca. I dumped it in a soup kettle and started the fire of buffalo chips. Everything was lovely except my supply of empty dishes in which to deposit the ebullient lava of pudding which kept frothing over the top. By night fall as the coyotes howled in derision, I had filled all the cups and saucers, sugar bowls and pitchers, and was about to start on the wash boiler, when the fire went out. Ever since then I have never doubted the Christian parable of feeding the five thousand, only I believe they must have used tapioca.

WHILE advocating greater self-reliance for the men folks as one good reason for becoming adepts around the homestead, it occurs to me that some women just naturally resent interference on the part of all interlopers, even such harmless and well meaning ones as husbands.

As brides they resent it because of a constant suspicion that you are trying to graft on some of your mother's deft and artful methods to make the new tree of life more fruitful and aromatic. They declare it to be the inalienable right of new wives to experiment with expensive flour and baking powder even at the risk of a bilious better-half.

In my own case that period of trial and error was surprisingly brief, considering that my bride had so little culinary practice beforehand. For the life of me I cannot recall a single batch of cemented cookies, or gawmy pie-crust, or liver-corroding omelets to harass my honeymoon. And through the subsequent years, with something like 20,000 menus she has planned and served to me and countless eager friends and sponging relatives, I should be the last man in the world to suggest an invasion of the kitchen. She knows it, and I know she knows I know it. I'd much prefer to advise others to try it.

It is her belief that if a man wishes to be useful around the house, let him install a simple tool-chest and do the fixing that belongs to the realms of man. She will set the table and do the salads, thank you, if only somebody with horse sense and a strong wrist would pack that leaky faucet, loosen a tight drawer, or clean up the sticky gas stove. But no, I stand around gawking at the kettles and inhaling the incense with no more of an eye to the needful jobs than a preacher in a brewery.

I harbor no resentment at her attitude. If I had done a successful task

for society 20,000 odd times like she has, and got better and better at every lick of the measuring spoon, there is no manner of doubt as to the superiority complex I should acquire forever more.

If the manual training courses had been more universal or if we had picked fathers with natural mechanical aptitude, I am sure many odds and ends jobs would be well adjusted in our homes without having to hire some union man to leave his tools and tracks all over the premises. And my wife resents that as much as having me around. But we are growing resigned to my clumsiness. You get ingenuity by inheritance or environment, or sometimes by a little of both. My nearest ancestors were evidently not gifted with manual dexterity, while our old school board in my youth thought "vocation" sounded too much like "vacation," and made us keep our noses stuck in books. So a poor excuse is better than no alibi. Though sometimes even a good alibi fails to soothe the ego.

ONE of my neighbors is constantly flaunting his talents with the tool-kit, particularly at critical times when I cannot afford to appear actually useless. I am rather helpless to meet him in rebuttal or revenge, for he doesn't play bridge or golf, and he is too dense to sense the utter depths of his defeat in any debate with me on what ails the farmer.

I hear him knocking and sawing and grinding at all uncouth hours of the day and night, and even on Sundays. My wife keeps repeating how proud and satisfied the neighbor woman is over her new hall-tree or sewing-cabinet; and in the summer time the fellow puts up a small tent on the lawn where he can show off, and slaps together bird baths, rose arbors, and picket fences. Next to being married to a genius the worst luck is being neighbor to one, and as a matter of fact I am in both boats at once and nearly sunk!

Wiseacres argue long and hard that compulsory military training is a good antidote for wars and a boon for home preparedness, but a sure cure for family wars and a certain aid to domestic bliss would be to compel every man child to take courses in cooking, carving, and carpentry—and forget the salutes and uniforms!

WHEN all else fails and our training is lacking, we can always fall back upon the passive attitude of just "being domestic." I mean by that pretending that you thoroughly enjoy mooching around in arm chairs, trying to get your mind off the office long enough to listen to something the kids have to chatter about. He who can slam his sanctum door and leave for home with no hang-over grouches or ponderous problems to enmesh him has come a long ways to glory.

I think I can measure up to this fairly well. Whether through inertia or low energy quotients, I do not cater to midnight poker shindigs, keno parties, or sessions in the pool hall or bowling alley. They are negative virtues no doubt, to be indifferent to such recreations, while the angle of thrift and self-denial attached to their renunciation gives one a sort of happy glow. Anyhow it allows me full time to get better acquainted with my family, whom I only see at best for about four waking hours out of twenty-four. And considering what it costs to run the outfit, that's a small enough time return on the original investment. In other words, I never could see how some dads could plunk down hard-earned simoleons on a domestic scene and only go there to snore.

All of which reminds me, I've got to pay my taxes this week and order another tank of oil—which are my public assurances that in spite of shortcomings, I am still able to be somewhat useful around the home!

SOLO CELEBRATION

The Negro was dressed up in his best clothes and was strutting majestically up and down the street.

"Are you not working today, Sambo?" asked a passer-by.

"No, suh," replied Sambo. "I'se celebrating my golden weddin'."

"Then you were married 50 years ago today?"

"Yassah."

"Well, why isn't your wife celebrating with you?"

"My present wife, suh," replied Sambo, in dignified tones, "ain't got nothin' to do with it, her's the fourth."

American Tourist (to Canadian Northwest Indian)—"White man glad to see red man. White man hopes big Chief is feeling tip top this morning."

Indian (calling)—"Hey, Jake, come here and listen to this bozo; he's great!"

SURPRISE ENDING

A parrot was sitting in the salon of a luxurious liner watching a magician do tricks. The magician served notice that he was now going to do a trick never before accomplished. He pulled up his sleeves and proceeded to make a few fancy gestures. Just at that moment the ship's boilers blew up. Five minutes later, as the parrot came to floating on a piece of driftwood, he muttered: "Damn clever, d a m n clever."

An Englishman, Irishman, and a Scotchman entered a cafe and ordered beer. When served each glass of beer had a fly in it.

The Englishman used a spoon to take his out.

The Irishman blew his out.

The Scotchman wrung his out.

Old Man: "I'll give you a dime, little girl, if you give me a kiss."

Little Girl: "Pooh on that stuff—I can get a quarter for taking castor oil."

His first day on the job, the colored hallboy dashed excitedly up to the register desk.

"De man in room seben has done hang himself!"

Clerk: "Hanged himself? Did you cut him down?"

Hall Boy: "No sah! He ain't dead yet!"

A sailor, after placing some flowers on a grave in a cemetery, noticed an old Chinaman placing a bowl of rice on a nearby grave, and asked: "What time do you expect your friend to come up and eat the rice?"

The old Chinaman replied with a smile: "Same time your friend come up to smell flowers."

Dog Catcher: "Little boy, do your dogs have licenses?"

Boy: "Yes, Sir! They're just covered with them."

Potash Deficiency Symptoms

By ECKSTEIN, BRUNO *and* TURRENTINE

(A new publication—248 pages in German, French, and English—profusely illustrated with 55 plates in 4 colors and 41 striking figures in black and white.)

This work presents comprehensive information on characteristic potash deficiency symptoms appearing on the most important cultivated crops. The comments accompanying each color plate make this a very practical hand-book for identifying potash starvation as it appears on 45 different crops.

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